MZ-R30

SERVICE MANUAL

US Model
Canadian Model
AEP Model
UK Model
E Model
Australian Model
Tourist Model

US and foreign patents licensed from Dolby Laboratories Licensing Corporation.

Model Name Using Similar Mechanism	NEW
MD Mechanism Type	MT-MZR30-124
Optical Pick-up Type	KMS-250A/J2N

SPECIFICATIONS

System
Audio playing system
MiniDisc digital audio system
Laser diode properties
Material: GaAlAs
Wavelength: l = 780 nm
Emission duration: continuous
Laser output: less than 44.6 µW
(This output is the value measured at a distance of 200 mm from the lens surface on the optical pick-up block.)
Recording and playback time
Maximum 74 minutes (MDW-74, stereo recording)
Maximum 148 minutes (MDW-74, monaural recording)
Revolutions
400 rpm to 900 rpm (CLV)
Error correction
Advanced Cross Interleave Reed Solomon Code (ACIRC)
Sampling frequency
44.1 kHz
Sampling rate converter
Input: 33 kHz/44.1 kHz/48 kHz

Coding
Adaptive TRansform Acoustic Coding (ATRAC)
Modulation system
EFM (Eight to Fourteen Modulation)
Number of channels
2 stereo channels
1 monaural channel
Frequency response
20 to 20,000 Hz ± 3 dB
Wow and Flutter
Below measurable limit
Inputs
Microphone: stereo mini-jack, 0.22 – 0.78 mV
Line in: stereo mini-jack, 69 – 194 mV
Optical (Digital) in: optical (digital) mini-jack
Outputs
Headphones: stereo mini-jack, maximum output level 5 mW+ 5 mW, load impedance 16 ohm
Line out: stereo mini-jack, 194 mV, load impedance 10 kilohm

– Continued on page 2 –

PORTABLE MINIDISC RECORDER

MICROFILM

SONY®

General

Power requirements
Sony AC power Adaptor (supplied)
connected at the DC IN 6 V jack :
120V AC, 60 Hz (US, Canadian model)
230 – 240V AC, 50/60 Hz (UK model)
240V AC, 50/60 Hz (Australian model)
220 – 230V AC, 50/60 Hz (AEP model)
100 – 240V AC, 50/60 Hz (E, Tourist model)
Lithium ion rechargeable battery LIP-12(H) (supplied)
Two LR6 (size AA) alkaline batteries (not supplied)
Battery operation time
See "Battery life" (page 25)
Dimensions
Approx. 116.5× 26 × 78 mm (w/h/d)
(4 5/8 × 1 1/16 × 3 1/8 in.)
Mass
Approx. 220 g (7.1 oz) the recorder only
Approx. 317 g (10.2 oz) incl. a recordable MD, remote controller, and LIP-12 lithium ion rechargeable battery
Supplied accessories
AC power adaptor (1)
Headphones with a remote controller (1)
LIP-12 lithium ion rechargeable battery (1)
Ear pads (2)
Carrying pouch (1)
Dry battery case (1)

Design and specifications are subject to change without notice.

For customers in Europe

CLASS 1 LASER PRODUCT
LUOKAN 1 LASERLAITE
KLASS 1 LASERAPPARAT

This MiniDisc Recorder is classified as a CLASS 1 LASER product.
The CLASS 1 LASER PRODUCT label is located on the buttom exterior.

IN NO EVENT SHALL SELLER BE LIABLE FOR ANY DIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES OF ANY NATURE, OR LOSSES OR EXPENSES RESULTING FROM ANY DEFECTIVE PRODUCT OR THE USE OF ANY PRODUCT.

"MD WALKMAN" is a trademark of Sony Corporation.

CAUTION

Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.

Flexible Circuit Board Repairing

- Keep the temperature of the soldering iron around 270°C during repairing.
- Do not touch the soldering iron on the same conductor of the circuit board (within 3 times).
- Be careful not to apply force on the conductor when soldering or unsoldering.

Notes on chip component replacement

- Never reuse a disconnected chip component.
- Notice that the minus side of a tantalum capacitor may be damaged by heat.

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SAFETY-RELATED COMPONENT WARNING!!

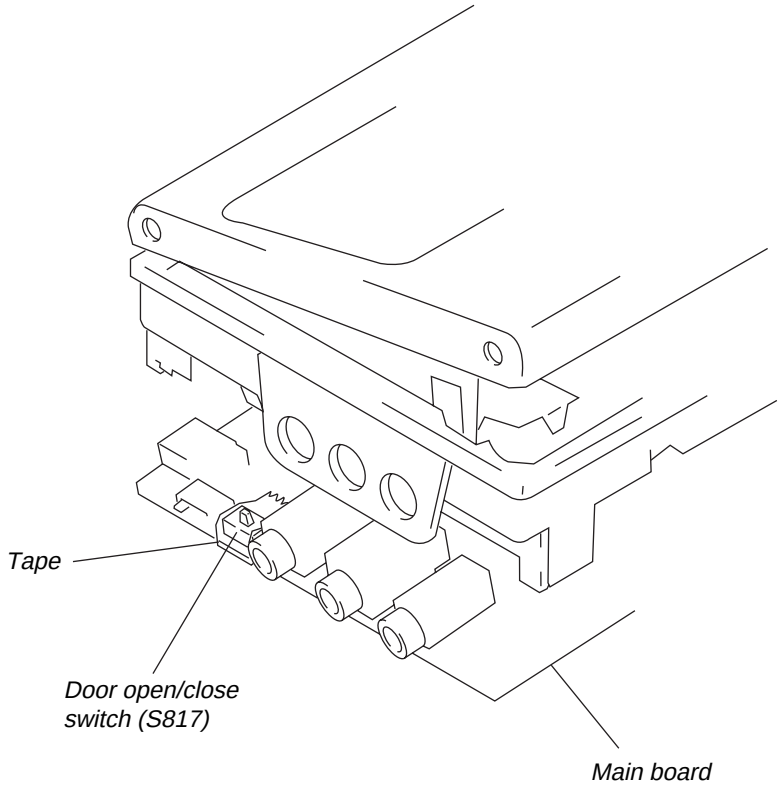
**COMPONENTS IDENTIFIED BY MARK ⚠ OR DOTTED LINE WITH MARK ⚠ ON THE SCHEMATIC DIAGRAMS AND IN THE PARTS LIST ARE CRITICAL TO SAFE OPERATION.
REPLACE THESE COMPONENTS WITH SONY PARTS WHOSE PART NUMBERS APPEAR AS SHOWN IN THIS MANUAL OR IN SUPPLEMENTS PUBLISHED BY SONY.**

ATTENTION AU COMPOSANT AYANT RAPPORT À LA SÉCURITÉ!

LES COMPOSANTS IDENTIFIÉS PAR UNE MARQUE ⚠ SUR LES DIAGRAMMES SCHÉMATIQUES ET LA LISTE DES PIÈCES SONT CRITIQUES POUR LA SÉCURITÉ DE FONCTIONNEMENT. NE REMPLACER CES COMPOSANTS QUE PAR DES PIÈCES SONY DONT LES NUMÉROS SONT DONNÉS DANS CE MANUEL OU DANS LES SUPPLÉMENTS PUBLIÉS PAR SONY

SECTION 1
SERVICING NOTE

When repairing this device with the power on, if you remove the main board or open the upper panel assembly, this device stops working. In this case, you can work without the device stopping by fastening the hook of the Open/Close detection switch (S817) with tape.

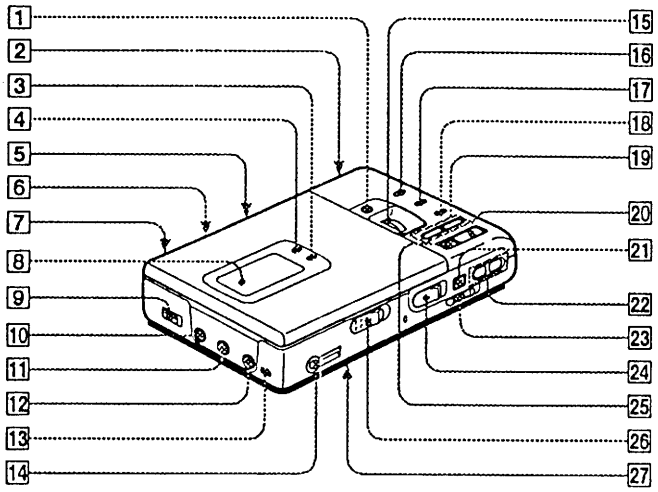


This section is extracted from instruction manual.

Looking at the controls

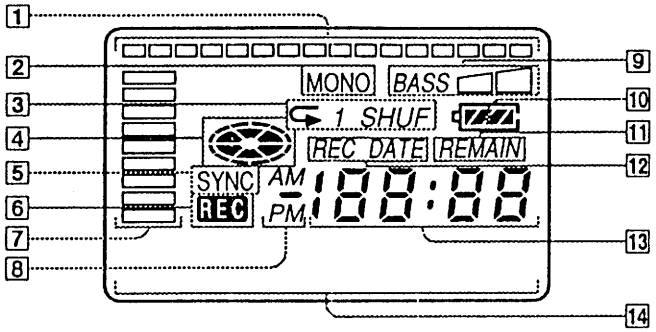
See pages in ( ) for more details.

The recorder

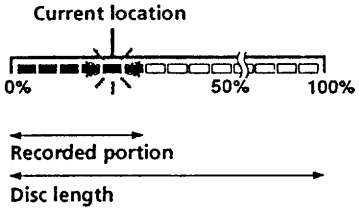


1 TITLE/ENTER button(22)
2 Battery compartment (on the bottom) (24)
3 MODE button (16)
4 DISPLAY button (14, 18)
5 MIC SENS switch (on the bottom) (12)
6 AVLS switch (on the bottom) (17)
7 DC IN 6V jack (at the rear) (6)
8 Display window (14,18)
9 SYNCHRO REC (synchro-recording) switch (11)
10 MIC (PLUG IN POWER) jack (12)
11 LINE IN (OPTICAL) jack (6, 11)
12 LINE OUT jack (19)
13 DIGITAL MEGA BASS button (17)
14 ∩ (headphones)/REMOTE jack (8)
15 Vertical jog dial (16)
16 TRACK MARK button (21)
17 END SEARCH button (7)
18 ERASE button (20)
19 ⏮/⏭ (search / AMS) button (7, 9)
20 ► (play) button (7, 9)
21 ❚❚ (pause) button (7, 9)
22 VOLUME +/– button (9)
23 HOLD switch (18)
24 REC (record) switch (7)
25 ■ (stop) button (7, 9)
26 OPEN button (6)
27 CLOCK SET button (on the bottom) (15)

The display window

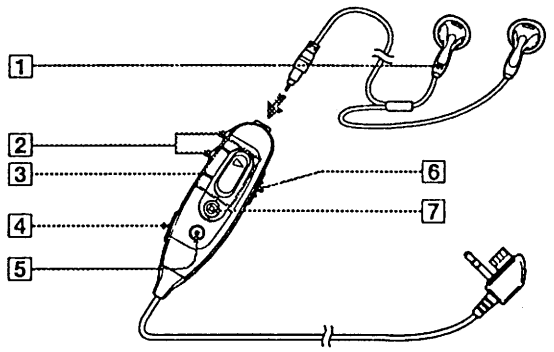


[1] Position indicator (14, 18)
Shows the current location on the MD. The point under recording or playing flashes. The recorded portion lights up.



[2] MONO (monaural) indication
[3] Play mode indication
Shows the play mode of the MD.
[4] Disc indication
Shows that the disc is rotating for recording, playing or editing an MD.
[5] SYNC (synchro-recording) indication
[6] REC indication (7)
Lights up while recording. When flashing, the recorder is in record standby mode.
[7] Level meter
Shows the volume of the MD being played or recorded.
[8] AM/PM indication (15)
Lights up along with the time indication in the 12-hour system.
[9] Mega bass indication (17)
[10] Battery indication (24)
Shows battery condition.
[11] REMAIN (remaining time/tracks) indication (14,18)
Lights up along with the remaining time of the track, the remaining time of the MD, or the remaining number of tracks.
[12] REC DATE (recorded/current date) indication
Lights up along with the date and time the MD was recorded. When only "DATE" lights up, the current date and time are displayed.
[13] Time display (15)
Shows the recorded time, current time, elapsed time of the track or MD being recorded or played.
[14] Character information display (14,18)
Displays the disc and track names, date, error messages, track numbers, etc.

The headphones with a remote controller



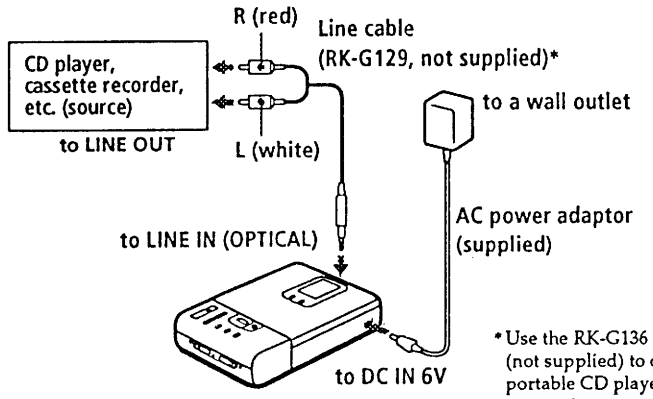
[1] Headphones
Can be replaced with optional headphones.
[2] VOL (volume) +/– buttons (9)
[3] ► (play)/I◄◄ /►►I (search, AMS) buttons
Press ► to play. While playing, press the I◄◄ side to find beginning of the current or preceding tracks or to search backward, or press the ►►I side to find the beginning of the succeeding tracks or to search forward.
[4] TRACK MARK button (21)
[5] ❚❚ (pause) button (7,9)
[6] HOLD switch (18)
Slide to lock the controls of the remote controller.
[7] ■ (stop) button (7,9)

Additional information

Recording an MD right away!

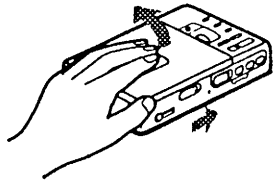
The source sound of CDs or tapes will be sent as an analog signal and recorded digitally. The recorded sound will be stereo. When you record from a digital source, see "Recording with digital input" (page 11).

1 Make connections.

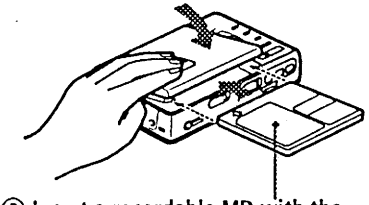


* Use the RK-G136 connecting cord (not supplied) to connect to a portable CD player having a stereo-mini jack.

2 Insert a recordable MD.

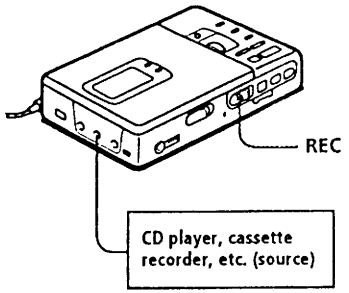


① Slide OPEN and open the lid.



② Insert a recordable MD with the label side facing up, and press the lid down to close.

3 Record an MD.



① **Slide REC to the right while pressing its button.**
"REC" lights up and recording starts.

② **Play the CD or tape you want to record.**

To stop recording, press ■.
"Toc Edit" flashes to record data of the recording (the track's start and end points, etc.). Do not move or jog the recorder or disconnect the power source while the indication is flashing in the display.

To	Press
Pause	II [1] Press II again to resume recording.
Add recording to the end of the previous recording.	END SEARCH and slide REC.
Record over partway through the previous recording.	►, ►►I or I◄◄ to find the start point of recording and press ■ to stop. Then slide REC.
Remove the MD.	■ and open the lid. [2]

[1] A new track is added at the point where you pressed II, and the recording will be marked with the new track number when you resume recording.
[2] Once you open the lid, the point to start recording will change to the beginning of the first track. When recording on a recorded MD, check the point to start recording on the display.

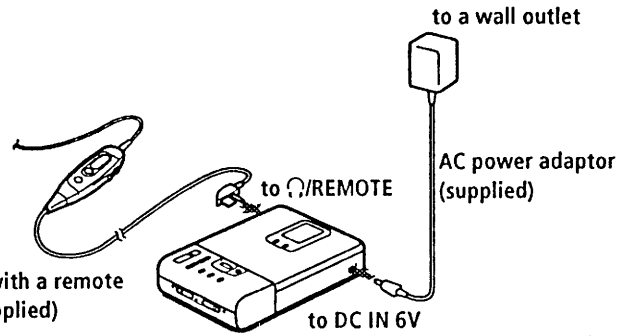
If the recording does not start
- Make sure the recorder is not locked (page 18).
- Make sure the MD is not record-protected (page 27).
- Premastered MDs cannot be recorded over.

Tips
- The level of the recorded sound is adjusted automatically.
- You can monitor the sound being recorded. Connect the supplied headphones with remote controller to Ω/REMOTE and adjust the volume by pressing VOLUME +/– (VOL +/– on the remote controller). Sound levels are copied onto the MD automatically and independently of the volume for monitoring.

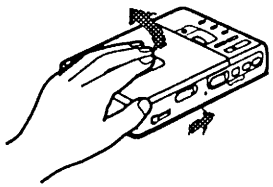
Playing an MD right away!

You can also use the rechargeable battery or dry batteries (see pages 24, 25).

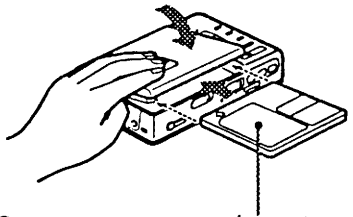
1 Make connections.



2 Insert an MD.

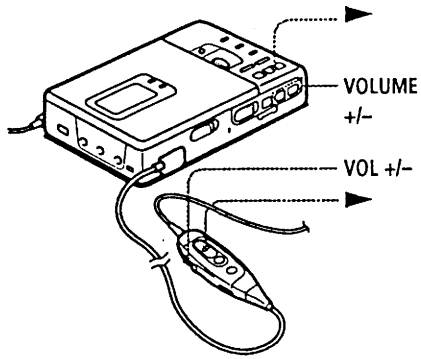


① Slide OPEN and open the lid.



② Insert an MD with the label side facing up, and press the lid down to close.

3 Play an MD.



① Press ►.
A short beep sounds in the headphones.

② Press VOLUME +/– to adjust the volume.
You can check the volume in the display.

To stop play, press ■.
A long beep sounds in the headphones.

To	Press (Beeps in the headphones)
Pause	❚❚ (Continuous short beeps) Press ❚❚ again to resume play.
Find the beginning of the current track	I◄◄ once (Three short beeps)
Find the beginning of the next track	►►I once (Two short beeps)
Go backwards while playing[1)]	keep pressing I◄◄
Go forward while playing[1)]	keep pressing ►►I
Remove the MD	■ and open the lid.[2)]

1) To go backward or forward quickly without listening, press ❚❚ and keep pressing I◄◄ or ►►I.
2) Once you open the lid, the point to start play will change to the beginning of the first track.

If the play does not start
Make sure the recorder is not locked (page 18).

Tip
The recorder automatically switches to play the stereo or monaural sound according to the recorded sound.

Two ways of connection to a sound source

The input jack of this recorder works as both digital and analog input jack. Connect the recorder to a CD player or a cassette recorder using either digital input or analog input. To record, see "Recording with digital input" (page 11) to record using digital input, and "Recording an MD right away!" (page 6) to record using analog input.

Difference between digital and analog inputs

Difference / Input (connection)	Digital input	Analog (line) input
Connectable source	Equipment with an optical digital output jack	Equipment with an analog (line) output jack
Usable cord	Digital cable (with an optical or an optical-mini plug)	Line cable (with 2 phono plugs or a stereo-mini plug)
Signal from the source	Digital	Analog Even when a digital source (such as a CD) is connected, the signal sent to the recorder is analog.
Recorded track numbers	Marked (copied) automatically •at the same positions as the source. •when the recorder is paused while recording.	Marked •after more than 2 seconds of silence. •when the recorder is paused while recording. You can erase unnecessary marks after recording ("Erasing a track mark", page 21).
Recorded sound level	Same as the source	Adjusted automatically. Can also be adjusted manually ("Adjusting the recording level", page 13).

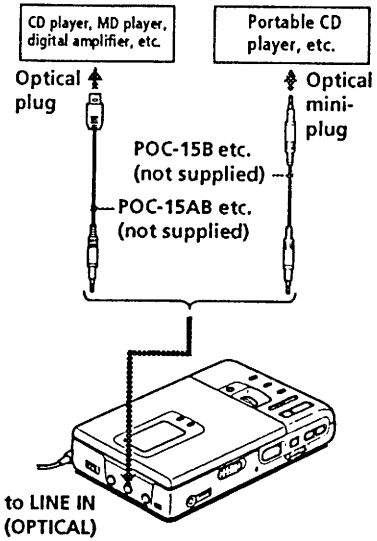
Note

Track marks may be copied incorrectly :

- when you record from some CD players or multi disc players using digital input.
- when the source is in shuffle or program play mode while recording using digital input. In this case, play the source in normal play mode.

Recording with digital input

This unit has a built-in sampling rate converter so that you can record programs from digital equipment using other sampling rates, such as a BS tuner or a DAT deck.



Insert a recordable MD and start recording.
To record, see "Recording an MD right away !" (page 6). To record from a portable CD player, set the CD player to pause and then start recording.

LINE IN (OPTICAL) jack is for both digital and analog input

The recorder automatically recognizes the line cable and switches to digital or analog input.

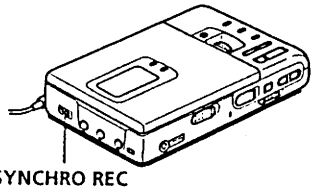
Notes

- You can make a digital recording only from an optical type output.
- Some portable CD players with the ESP* system cannot send out digital signals when it is activated. In this case, release the ESP system.

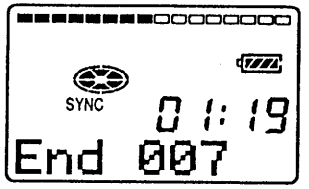
* Electronic Shock Protection

To start/stop recording with the player (Synchro-recording)

You can easily make digital recordings of a digital source on an MD.
Before synchro-recording, make connections to the digital source with a digital cable and the power source, and insert a recordable MD.



1 Slide SYNCHRO REC to ON.
"SYNC" appears in the display.



2 Slide REC to the right while pressing its button.
The recorder stands by for recording.
The recorder starts recording when you start playing the source player.

To stop synchro-recording, Press ■.

Tip

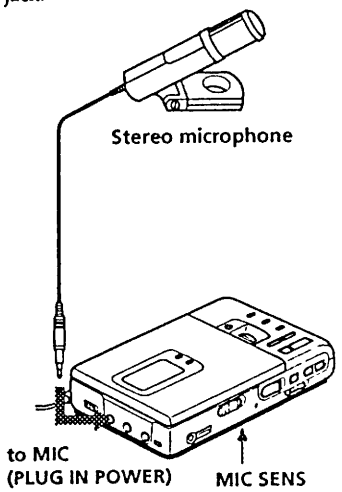
When there is no sound from the player more than 3 seconds during synchro-recording, the recorder stands by for recording automatically. When the sound comes from the player again, the recorder starts synchro-recording again.

Note

If you record in monaural, do steps 1 and 2 in "Recording in monaural for double the normal recording time of an MD" (page 12). before doing the synchro-recording steps.

Recording from a microphone

Connect a stereo microphone ECM-909A, ECM-MS907, ECM-717, etc., (not supplied) to the MIC (PLUG IN POWER) jack.



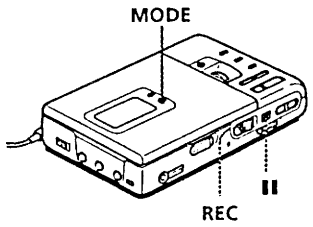
1 Select the input level with MIC SENS (on the bottom of the recorder). Usually, set it to HIGH. When you record loud sound such as a live concert, set it to LOW.

2 Insert a recordable MD and start recording.
Slide REC to the right while pressing its button.
"REC" lights up and recording starts.
For details, see "Recording an MD right away! " (page 6).

Note
To record from a microphone, you must first disconnect any digital source. If connected, the recorder will not switch to microphone input.

Recording in monaural for double the normal recording time of an MD

For longer recordings, choose to record in monaural sound. The recording time becomes double the normal.



1 While pressing **II**, slide REC to the right.
The recorder stands by for recording.

2 Press MODE.
"Mono REC" appears in the display, and the recorder switches to monaural recording.
Press MODE again to record in stereo sound.

3 Press **II** again to start recording.

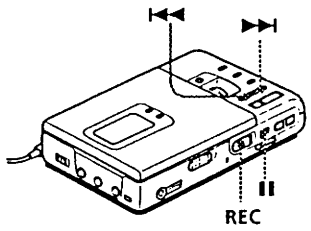
4 Play the sound source.

To stop recording, press ■.
The recorder switches back to stereo recording when you record the next time.

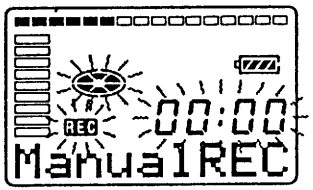
Notes
- If you record in monaural sound from a stereo source, the sounds from left and right will be mixed.
- You cannot record in monaural, if SYNCRO REC is slide to ON.
- The MDs recorded in monaural sound can be played back only with an MD player/recorder that has the monaural playing function.

Adjusting the recording level (Manual recording)

When you record with an analog input, the sound level is adjusted automatically. If necessary, you can set the level manually.



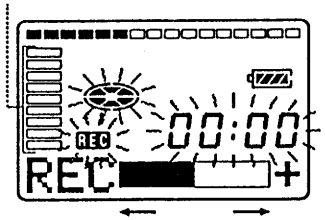
1 While holding down **II**, hold REC to the right for more than 2 seconds.
"ManualREC" appears and the recorder stands by for recording.
To return to the automatic control, while the recorder is in record pause mode, hold REC to the right for more than 2 seconds.



2 Play the source.

3 While observing the level meter in the display, adjust the recording level by pressing ▶▶I (+) or I◀◀ (–).
Set the level so that it hits the second indicator from the top when the recorder receives the maximum sound.

Level meter



Volume decreases ← → increases

Note
The recording level should be adjusted while the recorder is in standby mode. You cannot adjust it while recording.

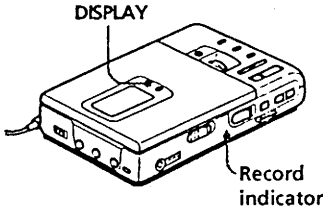
4 Press **II** again to start recording.

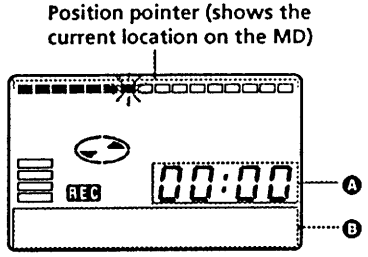
To stop recording, press ■.
The recording level control is switched back to automatic control.

When you record with microphone input, select the input level with MIC SENS (page 12).

Checking the remaining time or the recording position

1 Press DISPLAY while recording or in stop mode. Each time you press the button, the display changes as follows.





While recording

A	B
Elapsed time	Track number
Remaining time for recording	Track number
Current time[1]	Current date[1]

[1] Appears only when the clock is set.

In stop mode

A	B
Elapsed time	Track number
Remaining time for recording	Track name[1]
Remaining time after the current location	Disc name[2]
Current time[3]	Current date[3]

[1] The number of the track appears when the track has no name.
[2] Remaining number of tracks appears when the MD has no disc name.
[3] Appears only when the clock is set.

To know the recording condition

The record indicator lights up or flashes according to the recording condition.

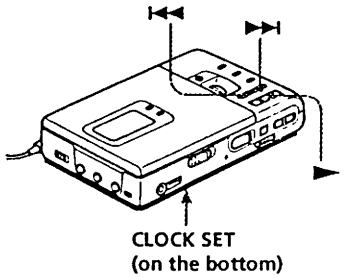
Recording condition	Record indicator
While recording	lights up flashes according to the loudness of the source while recording with a microphone (voice mirror)
Recording standby	flashes
Less than 3 minutes' recording time available	slowly flashes

Tip

If you want to check the playing position or track name while playing, see page 18.

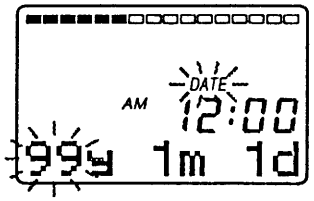
Setting the clock to stamp the recorded time

To stamp the date and time on the MD when you record, you first need to set the clock. When you use the recorder for the first time or after a long period of disuse, charge the built-in battery for the clock after setting the clock.



1 Connect the power source.
Use the supplied AC power adaptor.

2 Press CLOCK SET at the bottom of the recorder.
Use a pointed object.
The digits of the year flash.



3 Enter the current year by pressing ⏮ or ⏭.
To change the digits rapidly, keep pressing ⏮ or ⏭.

4 Press ►.
The digit of the month flashes.

5 Repeat steps 3 and 4 to enter the current month, date, hour, and minute.
When you press ► to set the minute, the clock starts operating.

If you make a mistake while setting the clock

Press ■, and set the clock again from step 2. You can skip a step by pressing ►.

To display the current time

When the recorder is not operating or while recording, press DISPLAY repeatedly until the current time appears in the display.

To display the time in the 24-hour system

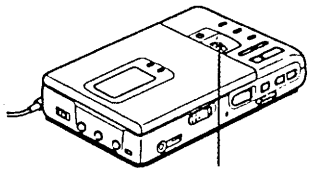
While setting the clock, press DISPLAY. To display the time in the 12-hour system, press DISPLAY again.

Charging the built-in battery for the clock

After setting the clock, leave the recorder connected to the AC power for about 2 hours to charge the built-in battery for the clock. Once charged, the built-in battery should last about a month without connecting to any of the power sources. The recorder will automatically charge the built-in battery while connected to AC power, dry batteries or a rechargeable battery.

Selecting the track number or track name directly

You can select the desired track directly by using the vertical jog dial.



1 Rotate the jog dial to select a track, and press it to play the selected track.

When you rotate the jog dial, the track name* appears in the display. To play the selected track, press the jog dial.

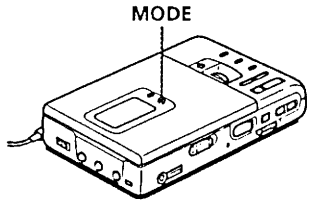
* If the track has no name, only the track number appears in the display.

Tip

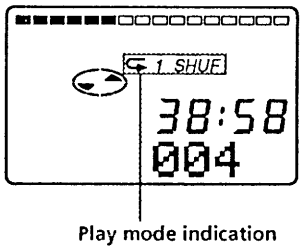
If you select a track in shuffle play mode, shuffle play starts from the selected track.

Playing tracks repeatedly

You can play tracks repeatedly in three ways — all repeat, single repeat, and shuffle repeat.



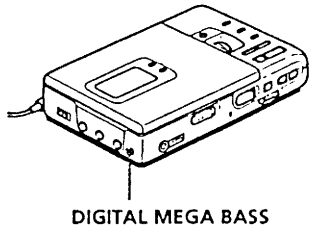
1 Press MODE while the recorder is playing an MD.
Each time you press MODE, the play mode indication changes as follows.



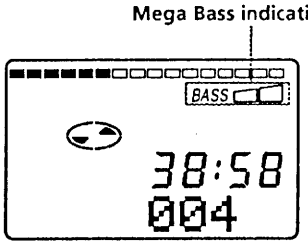
Indication	Play mode
none (normal play)	All the tracks are played once.
"↻" (all repeat)	All the tracks are played repeatedly.
"↻ 1" (single repeat)	A single track is played repeatedly.
"↻ SHUF" (shuffle repeat)	All the tracks are played repeatedly in random order.

Emphasizing bass (DIGITAL MEGA BASS)

Mega Bass function intensifies low frequency sound for richer quality audio reproduction. It affects only with the headphones.



1 Press DIGITAL MEGA BASS.
Each time you press DIGITAL MEGA BASS, the Mega Bass indication changes as follows.



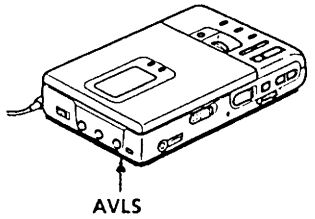
Indication	Play mode
none	Normal play
"BASS □"	Mega Bass (slight effect)
"BASS □□"	Mega Bass (strong effect)

Notes

- If the sound is distorted when emphasizing bass, turn down the volume.
- Mega Bass function does not affect the sound being recorded.
- Mega Bass dose not function when LINE OUT jack on the recorder is connected with a line cable.

Protecting your hearing (AVLS)

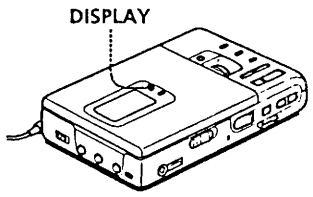
The AVLS (Automatic Volume Limiter System) function keeps down the maximum volume to prevent excessive sound from harming your ears.

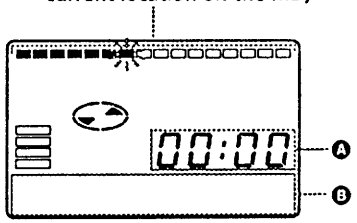


1 Set AVLS at the bottom of the recorder to LIMIT.
When you try to turn the volume, "AVLS" appears in the display. The volume is kept at a moderate level.

Checking the remaining time or the playing position

1 Press DISPLAY while playing. Each time you press DISPLAY, the display changes as follows.





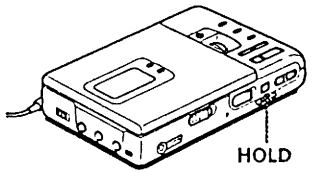
A	B
Elapsed time	Track number
Remaining time of the current track	Track name[1]
Remaining time after the current location	Disc name[2]
Recorded time[3]	Recorded date[3]

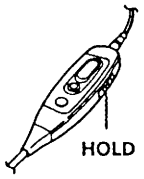
[1] Track number appears when the MD has no track name.
[2] Remaining number of the disc appears when the disc has no name.
[3] If you record without setting the clock or play an MD that has no recorded date, "--y--m--d" and "--:--" appear.

If you want to check the remaining time or the recording position while recording or in stop mode, see page 14.

Locking the controls

To prevent the buttons from being accidentally operated when you carry the recorder, use this function.



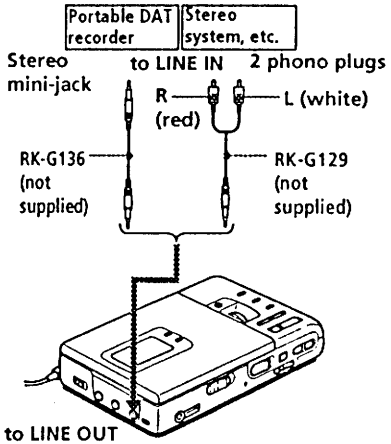


1 Slide HOLD in the direction of the →.

On the recorder, slide HOLD to lock the controls of the recorder. On the remote controller, slide HOLD to lock the controls of the remote controller. Slide HOLD in the opposite direction of the arrow to unlock the controls.

Connecting to a stereo system

Connect the LINE OUT jack of the recorder to the LINE IN jacks of an amplifier or a tape player with a line cable (RK-G129 or RK-G136, not supplied). The output is analog. The recorder plays the MD digitally and sends analog signals to the connected equipment.



Note

The Mega Bass dose not function or will be cancelled when the LINE OUT jack is connected with a line cable.

▶*Editing recorded tracks*

You can edit your recordings by adding/erasing track marks or labeling tracks and MDs. Premastered MDs cannot be edited.

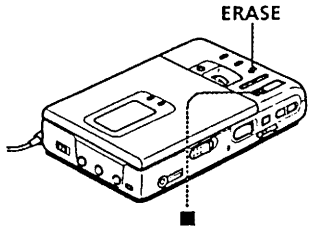
Notes on editing

- Do not move or jog the recorder while "Toc Edit" is flashing in the display.
- You cannot edit tracks on an MD that is record-protected. Before editing tracks, close the tab on the side of the MD.

Erasing tracks

To erase a track

Note that once a recording has been erased, you cannot retrieve it. Check the track number before erasing.



1 Press ERASE while playing the track you want to erase.
"Erase OK?" and "Push Erase" appear in the display alternately, and the recorder plays the selected track repeatedly. To cancel erasing, press ■.

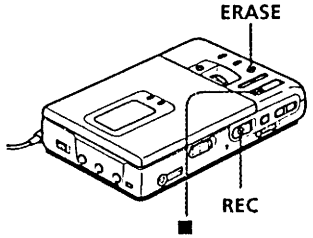
2 Check the track number in the display and press ERASE again.
The track is erased from the MD and the remaining tracks are renumbered.

To erase a part of a track

Add track marks at the beginning and the end of the part you want to erase, then erase the part.

To erase the whole disc

You can quickly erase all the tracks and data of the MD at a time.
Note that once a recording has been erased, you cannot retrieve it. Be sure to check the contents of the disc you want to erase.

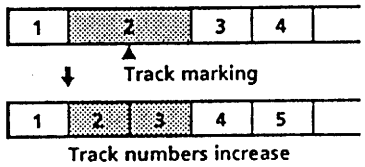


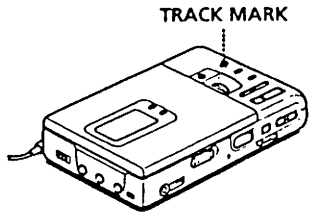
1 In stop mode, keep pressing ERASE and slide REC to the right.
"All Erase?" and "Push Erase" appear in the display alternately. To cancel erasing, press ■.

2 Press ERASE again.
"Toc Edit" flashes in the display. When erasing finishes, "BLANK DISC" appears.

Adding a track mark

You can add track marks so that the separated part after the track mark is as a new track.
The track numbers will increase as follows.





1 While playing or pausing an MD, press TRACK MARK on the recorder at the point you want to mark.
"MARK ON" appears in the display, and a track mark is added. The track number will increase by one.

To add track marks while recording

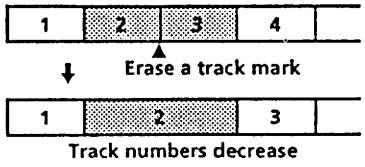
Press TRACK MARK on the recorder or the remote commander.

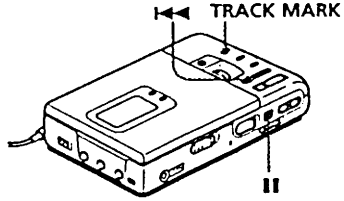
Note

TRACK MARK on the remote controller does not function during playback.

Erasing a track mark

When you record with analog (line) input, unnecessary track marks may be recorded. You can erase a track mark to combine the tracks before and after the track mark. The track numbers will change as follows.





1 While playing the track with the track mark you want to erase, press ❚❚ to pause.

2 Find the track mark by pressing ⏮ slightly.
For example, to erase the third track mark, find the beginning of the third track. "00:00" appears in the display.

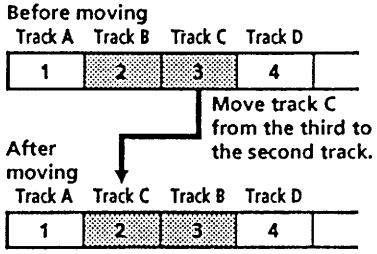
3 Press TRACK MARK to erase the mark.
"MARK OFF" appears in the display. The track mark is erased and the two tracks are combined.

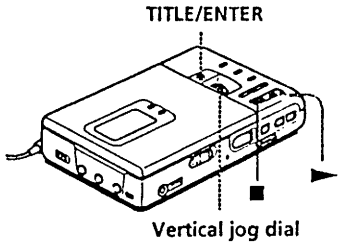
Tip

The combined track whose mark has been erased is recorded with the date and time of the beginning of the first of the two combined tracks.

Moving recorded tracks

You can change the order of the recorded tracks.





1 While playing, keep pressing ► and press TITLE/ENTER.
The recorder plays the selected track repeatedly.
For example above, "MV003→003" appears in the display.

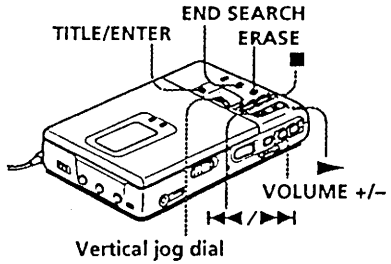
2 Rotate the vertical jog dial to select the new track position.
For example above, rotate the jog dial until "MV003→002" appears in the display.
To cancel moving, press ■.

3 Press TITLE/ENTER again.
Moving is completed and the recorder plays the moved track.

You can also move the track by pressing the jog dial in step 3.

Labeling recordings

You can label the MDs and tracks you recorded with letters, numbers, and marks. Each label can be made up of up to 200 characters, and each MD can hold up to 1700 characters.



1 To label a track, play the track you want to label.
To label an MD, insert the recordable MD you want to label.
If an MD is already inserted, press ■ to stop.

2 Press TITLE/ENTER.
If you have selected a track in step 1 above, the recorder will play that track repeatedly.
A cursor flashes in the display.

3 Use the vertical jog dial to select and enter a character.

Rotate to select. **Press to enter.**

Rotate the jog dial to select a character, and press the jog dial to enter the selected character. The cursor shifts rightward and stands by for the input of the next character.

Press	To
►	Select the first of capital letters, small letters, and numbers quickly.
I◄◄ /►►I	Move the cursor to the left or right.
END SEARCH	Insert a space.
ERASE	Delete a character.
■	Cancel labelling.

4 Repeat step 3 until you have entered all the characters for the label.

5 Press TITLE/ENTER.
Labeling is completed.

To cancel labelling
Press ■.

Available characters

- Capital and small letters of the English alphabet
- Numbers 0 to 9
- ! " # $ % & ( ) * + − . ; < = > ? @ _ ` ' , / : _(space)

To relabel recordings

Do steps 1 and 2 to display the label of the track or MD. Enter a new character over the one you want to change, then press TITLE/ENTER.

Notes

- You cannot relabel premastered MDs or label MDs that have not been recorded.
- The recorder is able to display "Kana" characters. But you cannot label with them on this recorder.

▶Power sources

You can use the recorder on house current or as follows.
In the recorder ...
- a lithium ion rechargeable battery (supplied)

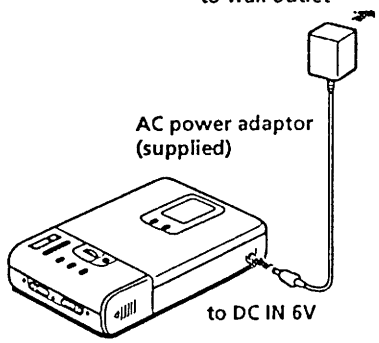
With supplied battery case ...
- dry batteries (not supplied)

It is preferable to use the recorder on house current when recording for a long time.

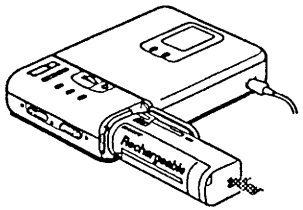
Using on a lithium ion rechargeable battery

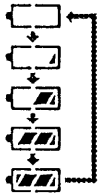
Before using the supplied LIP-12(H) lithium ion rechargeable battery for the first time, charge it in the recorder.

1 Connect the supplied AC power adaptor.



2 Insert the LIP-12(H) into the recorder and close the lid.





Battery indication appears in the display and charging starts.
When charging is completed, battery indication disappears.

Charging time

To charge a completely discharged battery, it takes the following time.

80%	Approx. 2.5 hours
100%	Approx. 5 hours

Tip

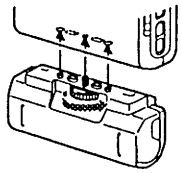
You can use the recorder while charging.

Notes

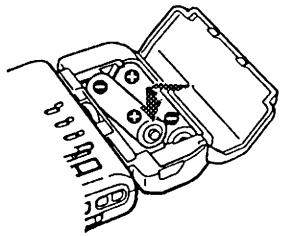
- Be sure to use the supplied AC power adaptor.
- Charging time may vary depending on the battery condition.

Using on dry batteries

1 Attach the supplied battery case.



2 Insert two LR6 (size AA) dry batteries (not supplied).



Battery life[1]

Batteries	Recording[2]	Playback
LIP-12(H) lithium ion rechargeable battery	Approx. 5 hours	Approx. 8 hours
Two LR6 (size AA) Sony alkaline dry batteries	----[3]	Approx. 6.5 hours
LIP-12(H) + Two LR6 (size AA)	----[3]	Approx. 15 hours

[1] The battery life may be shorter due to operating conditions and the temperature of the location.
[2] When you record, use a fully charged rechargeable battery.
[3] Recording time may differ according to the alkaline batteries.

When to replace the batteries

When the dry batteries or rechargeable battery are weak, flashing ▭ or "LOW BATT" appear in the display. Replace the dry batteries or charge the rechargeable battery.

Precautions

On safety
Do not put any foreign objects in the DC IN 6 V jack.

On power sources
- Use house current, lithium ion rechargeable battery, two LR6 (size AA) batteries, or car battery.
- For use in your house: Use the AC power adaptor supplied with this recorder. Do not use any other AC power adaptor since it may cause the recorder to malfunction.

Polarity of the plug

- The recorder is not disconnected from the AC power source (mains) as long as it is connected to the wall outlet, even if the recorder itself has been turned off.
- If you are not going to use this recorder for a long time, be sure to disconnect the power supply (AC power adaptor, dry batteries, rechargeable battery, or car battery cord). To remove the AC power adaptor from the wall outlet, grasp the adaptor plug itself; never pull the cord.
- For use in the car : Use the CPA-9 car connecting pack (not supplied)

On heat build-up
Heat may build up in the recorder if it is used for an extended period of time. In this case, leave the recorder turned off until it cools down.

On installation
- Never use the recorder where it will be subjected to extremes of light, temperature, moisture or vibration.
- Never wrap the recorder in anything when it is being used with the AC power adaptor. Heat build-up in the recorder may cause malfunction or damage.

On the headphones
Road safety
Do not use headphones while driving, cycling, or operating any motorized vehicle. It may create a traffic hazard and is illegal in many areas. It can also be potentially dangerous to play your recorder at high volume while walking, especially at pedestrian crossings. You should exercise extreme caution or discontinue use in potentially hazardous situations.

Preventing hearing damage
Avoid using headphones at high volume. Hearing experts advise against continuous, loud and extended play. If you experience a ringing in your ears, reduce the volume or discontinue use.

Caring for others
Keep the volume at a moderate level. This will allow you to hear outside sounds and to be considerate of the people around you.

On the MiniDisc cartridge
- Do not break open the shutter.
- Do not place the cartridge where it will be subject to light, extreme temperatures, moisture or dust.

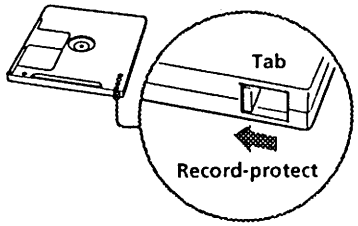
On cleaning
- Clean the recorder casing with a soft cloth slightly moistened with water or a mild detergent solution. Do not use any type of abrasive pad, scouring powder or solvent such as alcohol or benzene as it may mar the finish of the casing.
- Wipe the disc cartridge with a dry cloth to remove dirt.
- Dust on the lens may prevent the unit from operating properly. Be sure to close the disc compartment lid after inserting and ejecting an MD.

Notes on batteries
Incorrect battery usage may lead to leakage of battery fluid or bursting batteries. To prevent such accidents, observe the following precautions:
- Install the + and − poles of the batteries correctly.
- Do not install new and used batteries or different kinds of batteries together.
- Do not try to recharge dry batteries.
- When the recorder is not to be used for a long time, be sure to remove the batteries.
- If a battery leak should develop, carefully and thoroughly wipe away battery fluid from the battery compartment before inserting new ones.

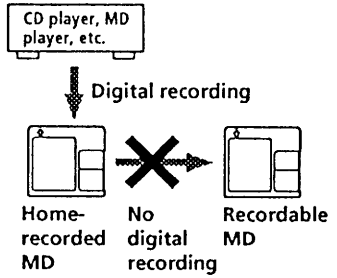
Note on mechanical noise
The recorder produces out mechanical noise while operating, which is caused by the power-saving system of the recorder and it is not a problem.

To protect a recorded MD
To record-protect an MD, slide open the tab at the side of the MD. In this position, the MD cannot be recorded. To record again, slide the tab back so the tab is visible.

Back of the MD



Note on digital recording
This recorder uses the Serial Copy Management System, which allows only first-generation digital copies to be made of premastered software. You can only make copies from a home-recorded MD by using the analog (line out) connections.



If you have any questions or problems concerning your recorder, please consult your nearest Sony dealer.

Troubleshooting

Should any problem persists after you have made these checks, consult your nearest Sony dealer.

Symptom	Cause/Solution
The recorder does not work or works poorly.	• Audio sources may not be securely connected. ➡ Disconnect the audio sources once and connect them again (pages 6,11). • Moisture has condensed inside the recorder. ➡ Take the MD out and leave the recorder in a warm place for several hours until the moisture evaporates. • The rechargeable battery or dry batteries are weak (▭ or "LOW BATT" flashes). ➡ Charge the rechargeable battery or replace the dry batteries (pages 24, 25). • The rechargeable battery or dry batteries have been installed incorrectly. ➡ Install the batteries correctly (page 25). • You pressed a button while the disc indication was rotating quickly. ➡ Wait until the indication rotates slowly. • The recording volume is too low. • The AC adaptor was unplugged during recording or a power outage occurred. • While operating, the recorder received a mechanical shock, too much static, abnormal power voltage caused by lightning, etc. ➡ Restart the operation as follows. 1 Disconnect all the power sources. 2 Leave the recorder for about 30 seconds. 3 Connect the power source.
No sound comes through the headphones.	• The headphones plug is not firmly connected. ➡ Connect the headphones with a remote controller plug firmly to Ω/REMOTE. • Volume is too low. ➡ Adjust the volume by pressing VOLUME +/– (VOL +/– on the remote controller). • AVLS is on. ➡ Side AVLS to NORMAL (page 17).
An MD is not played from the first track.	• Disc playing stopped before it came to the last track. ➡ Press I◄◄ repeatedly or open and close the lid once to go back to the beginning of the disc, and restart playing after checking the track number in the display.

Symptom	Cause/Solution
Playback sound skips.	• The recorder is placed where it receives continuous vibration. ➡ Put the recorder on a stable place. • A very short track may cause sound to skip.
Sound has a lot of static.	• Strong magnetism from a television or such device is interfering with operation. ➡ Move away from the source of strong magnetism.
Cannot find the track marks.	• You pressed II after pressing I◄◄ or ►►I. ➡ Press II before pressing I◄◄ or ►►I.
Charging the rechargeable battery does not start.	• The rechargeable battery has been inserted incorrectly or the AC power adaptor has been connected incorrectly. ➡ Insert the battery correctly or connect the AC power adaptor correctly.
The clock loses time or the display flashes. The recording date was not stamped onto the disc.	• The built-in battery for a clock is weak. ➡ Connect the AC power adaptor to DC IN 6 V on the recorder and the wall outlet to charge the built-in battery. After charging, set the clock again. Note that the clock normally loses about 2 minutes per month (page 15).

System limitations

The recording system in your MiniDisc recorder is radically different from those used in cassette and DAT decks and is characterized by the limitations described below. Note, however, that these limitations are due to the inherent nature of the MD recording system itself and not to mechanical causes.

Symptom	Cause
"TR FULL" appears even before the disc has reached the maximum recording time (60 or 74 minutes).	When 254 tracks have been recorded on the disc, "TR FULL" appears regardless of the total recorded time. More than 254 tracks cannot be recorded on the disc. To continue recording, erase unnecessary tracks.
"TR FULL" appears even before the disc has reached the maximum track number or recording time.	Repeating recording and erasing may cause fragmentation and scattering of data. Although those scattered data can be read, each fragment is counted as a track. In this case, the number of tracks may reach 254 and further recording is not possible. To continue recording, erase unnecessary tracks.
Track marks cannot be erased.	When the data of a track is fragmented, the track mark of a fragment under 12 seconds long cannot be erased.
The remaining recording time does not increase even after erasing numerous short tracks.	Tracks of under 12 seconds in length are not counted and so erasing them may not lead to an increase in the recording time.
The total recorded time and the remaining time on the disc may not total the maximum recording time (60 or 74 minutes).	Recording is done in minimum units of 2 seconds each, no matter how short the material. Even if the last unit of recording is less than 2 seconds, it is counted as a unit of 2 seconds. Then 2 seconds' space is put before recording starts again to prevent the last unit of the previous track from being erased. The contents recorded may thus be shorter than the maximum recording capacity.
The edited tracks may exhibit sound dropout during search operations.	The fragmentation of data may cause sound dropout while searching because the tracks are played in higher speed than normal playback.

Error messages

If the following error messages flash in the display window, check the chart below.

Error message	Meaning/Remedy
BLANKDISC	• An MD with no recording on it is inserted. ➔ Insert a recorded MD.
DISC ERR	• The recorder cannot read the disc (it's scratched or dirty). ➔ Reinsert or replace the disc.
DISC FULL	• There is no more space to record on the disc (less than 12 seconds available). ➔ Replace the disc.
BUSY	• You tried to operate the recorder while it was accessing the recorded data. ➔ Wait until the message goes out (in rare cases, it may take 2–3 minutes).
NAME FULL	• You tried to enter more than 200 characters for a track or disc name or the total characters entered in an MD is more than 1700. ➔ Enter the characters within the limit.
Hi DC in	• Power supply is too high (The supplied AC power adaptor or the recommended car battery cord is not used). ➔ Use the supplied AC power adaptor or the recommended car battery cord.
HOLD	• The recorder is locked. ➔ Slide HOLD against the allow to unlock the recorder (page 18).
LOW BATT	• Batteries are weak. ➔ Charge the rechargeable battery or replace the dry batteries (pages 24, 25).
MEM OVER	• You tried to record when the recorder is placed where it receives continuous vibration. ➔ Put the recorder on the stable place, and start recording again.
NO COPY	• You tried to make a copy from a disc that is protected by the Serial Copy Management System. You cannot make copies from a digitally connected source which was itself recorded using the digital connection. ➔ Use the analog connection instead (page 6).
NO DISC	• You tried to play or record with no disc in the recorder. ➔ Insert an MD.

Error message	Meaning/Remedy
NO SIGNAL	• The recorder could not detect digital input signals. ➡ Make sure that the source is connected firmly (page 11). • If the error message appears while recording, press ■ to stop recording.
PB ONLY	• You tried to record or edit on a premastered MD (PB means playback.) ➡ Insert a recordable MD.
PROTECTED	• You tried to record or edit on a MD with the tab in the record-protect position. ➡ Slide the tab back (page 27).
SORRY	• You tried to erase a track mark while playing the MD or at the beginning of the first track. • You tried to erase a track mark to combine tracks the recorder cannot combine. (caused by system limitation)
TEMP OVER	• Heat has built up in the recorder. ➡ Let the recorder cool down.
TR FULL	• There is no more space for new data when you are editing the MD. ➡ Erase unnecessary tracks (page 20).
TrPROTECT	• You tried to record or edit on a track that is protected from erasing. ➡ Record or edit on other tracks.

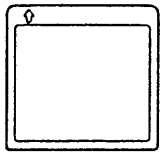
What is MD?

How MiniDisc works

MiniDisc (MD) comes in two types: premastered (prerecorded) and recordable (blank). Premastered MDs, recorded at music studios, can be played back almost endlessly. However, they can't be recorded on or over like cassette tapes. To record, you must use a "recordable MD".

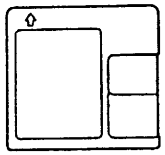
Premastered MDs

Premastered MDs are recorded and played like regular CDs. A laser beam focuses on the pits in the surface of the MD and reflects the information back to the lens in the recorder. The recorder then decodes the signals and plays them back as music.



Recordable MDs

Recordable MDs, which use magneto-optical (MO) technology, can be recorded again and again. The laser inside the recorder applies heat to the MD, demagnetizing the magnetic layer of the MD. The recorder then applies a magnetic field to the layer. This magnetic field corresponds exactly to the audio signals generated by the connected source. (The north and south polarities equate to digital "1" and "0".) The demagnetized MD adopts the polarity of the magnetic field, resulting in a recorded MD.

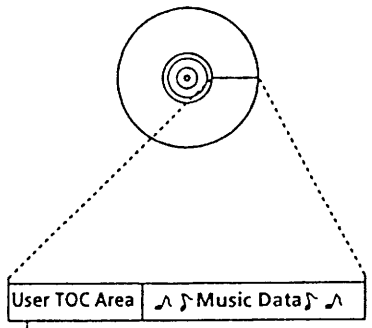


How the MiniDisc got so small

The 2.5-inch MiniDisc, encased in a plastic cartridge that looks like a 3.5-inch diskette (see illustration below), uses a new digital audio compression technology called ATRAC (Adaptive TRansform Acoustic Coding). To store more sound in less space, ATRAC extracts and encodes only those frequency components actually audible to the human ear.

Quick Random Access

Like CDs, MDs offer instantaneous random access to the beginning of any music track. Premastered MDs are recorded with location addresses corresponding to each music selection. Recordable MDs are manufactured with a "User TOC Area" to contain the order of the music. The TOC system is similar to the "directory management system" of floppy disks. In other words, starting and ending addresses for all music tracks recorded on the disc are stored in this area. This lets you randomly access the beginning of any track as soon as you enter the track number (AMS), as well as label the location with a track name as you would a file on a diskette.



Contains the order and start/end points of the music.

Shock-Resistant Memory

One major drawback of optical read systems is that they can skip or mute when subjected to vibration. The MD system resolves this problem by using a buffer memory that stores audio data.

SECTION 3
DISASSENBLY

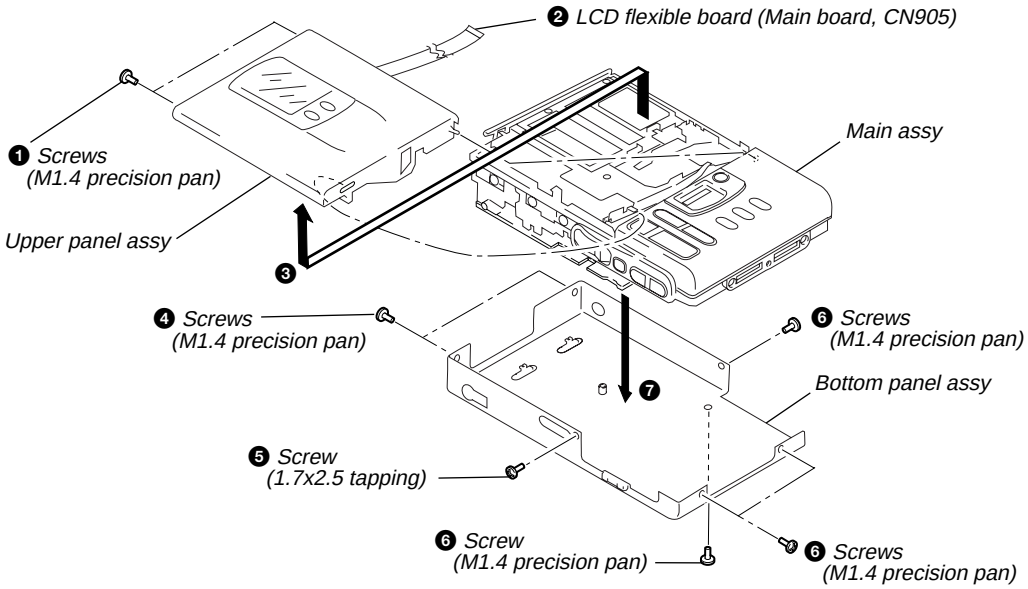
● The equipment can be removed using the following procedure.

Set → Panel (upper, bottom) assy → Main board → Mechanism deck → Optical pick-up assy, Control board, Rec board

Panel (upper, bottom) assy → Battery case assy → Switch board, Power board, Battery case

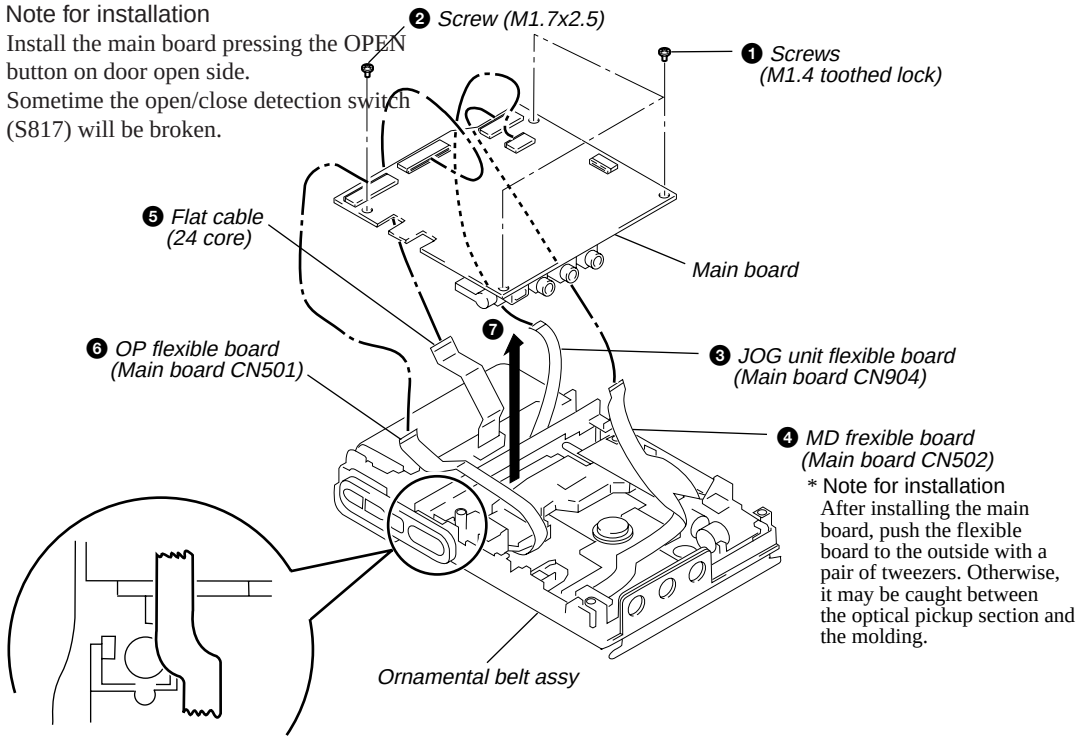
Note: Follow the disassembly procedure in the numerical order given.

3-1. UPPER PANEL ASSY, BOTTOM PANEL ASSY REMOVAL



3-2. MAIN BOARD REMOVAL

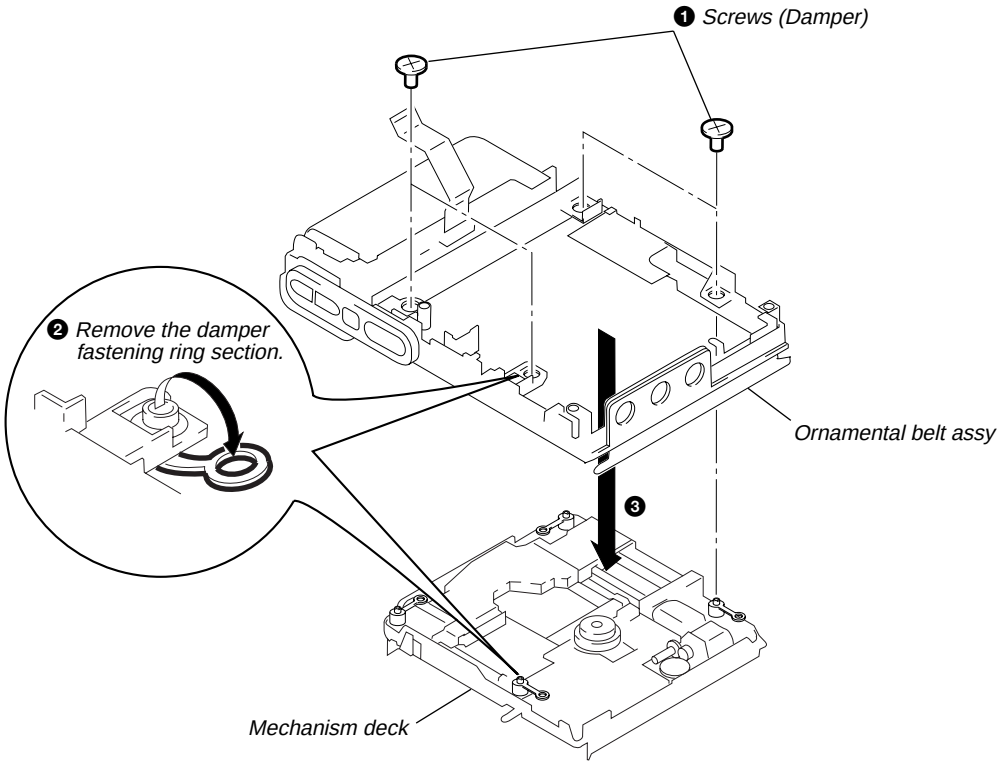
* Note for installation
Install the main board pressing the OPEN button on door open side.
Sometime the open/close detection switch (S817) will be broken.


❷ Screw (M1.7x2.5)
❶ Screws (M1.4 toothed lock)
❺ Flat cable (24 core)
Main board
❼
❻ OP flexible board (Main board CN501)
❸ JOG unit flexible board (Main board CN904)
❹ MD frexible board (Main board CN502)
Ornamental belt assy

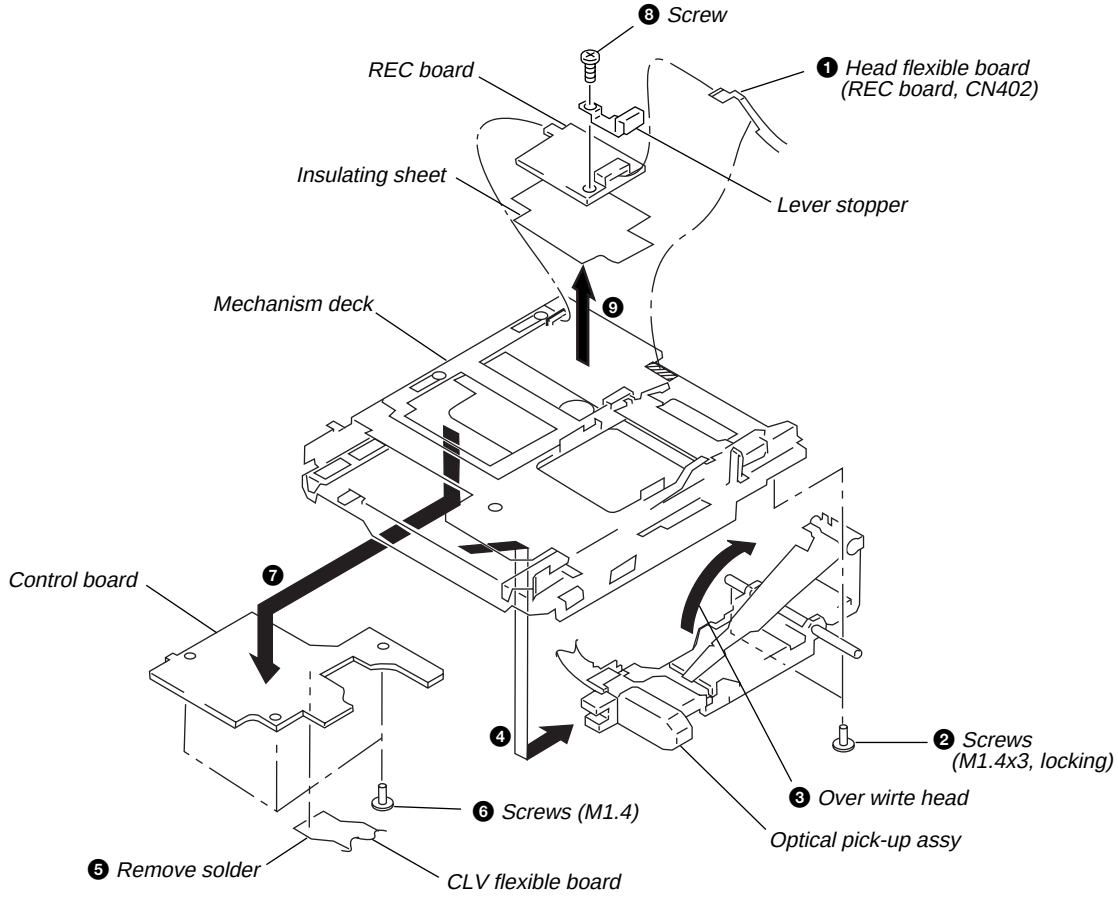
* Note for installation
After installing the main board, push the flexible board to the outside with a pair of tweezers. Otherwise, it may be caught between the optical pickup section and the molding.

* Note for installation
After installing the main board, make the flexible board ride on the molding. If you hold the flexible board and main board with a pair of tweezers, the board will ride correctly.

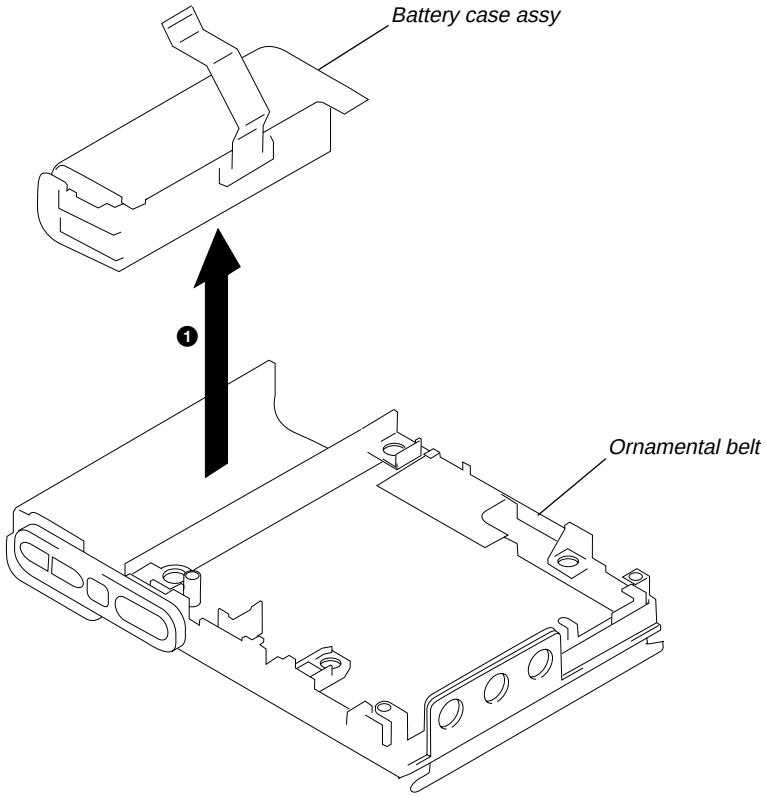
3-3. MECHANISM DECK (MT-MZR30-124) REMOVAL



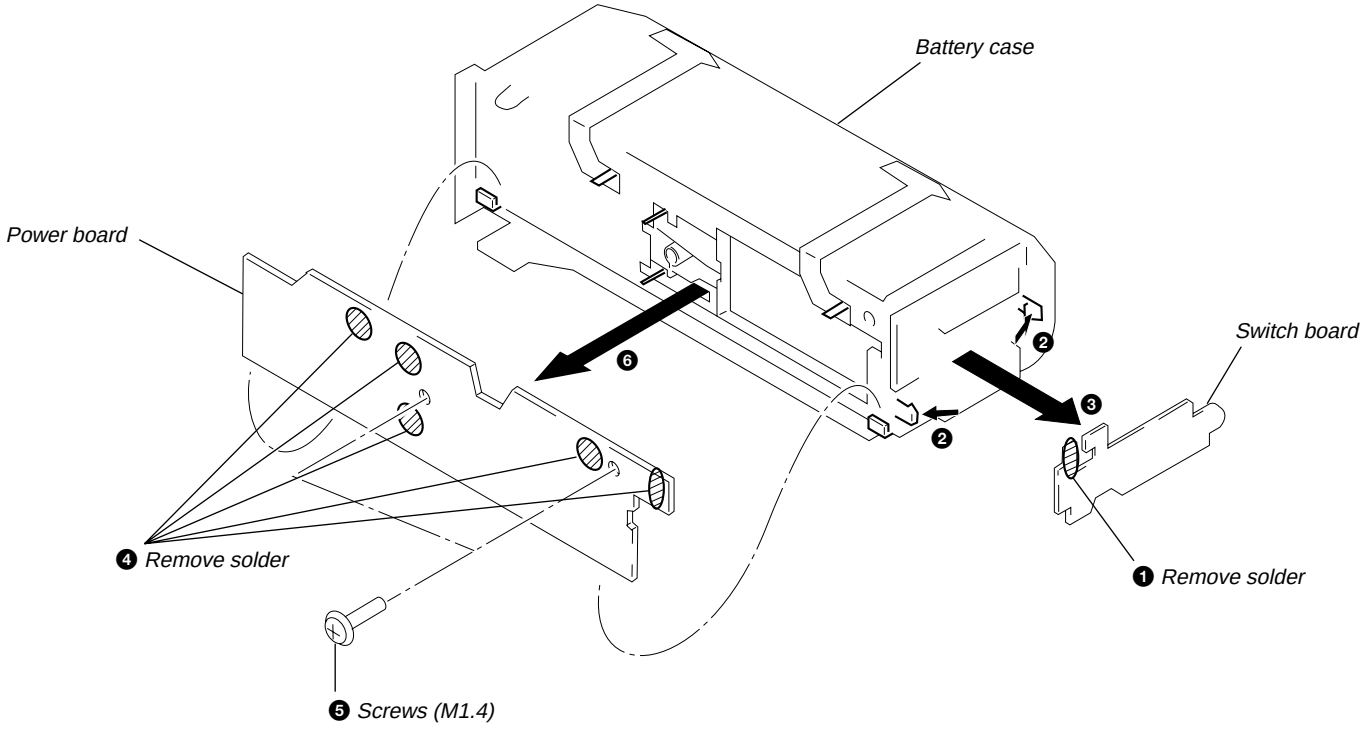
3-4. OPTICAL PICK-UP ASSY, CONTROL BOARD, REC BOARD REMOVAL



3-5. BATTERY CASE ASSY REMOVAL



3-6. SWITCH BOARD, POWER BOARD REMOVAL



SECTION 4
TEST MODE

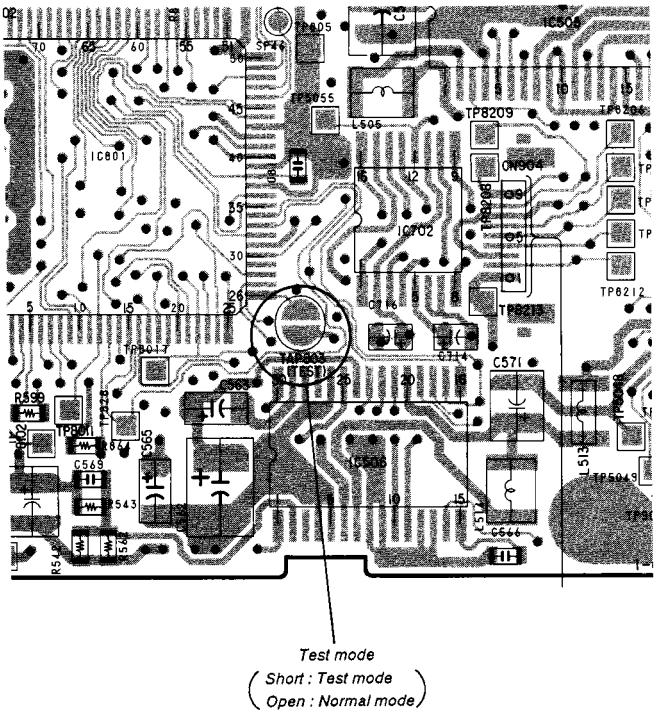
[Outline]

- The general adjustment mode of this unit performs CD and MO adjustments automatically when set. In this mode, the disc is determined if CD or MO and adjustments are automatically performed in order. If errors are detected , the faulty locations are displayed. The servo mode performs each adjustment automatically.

[Setting the Test Mode]

Short-circuit the soldering bridge of TAP803 (TEST) on the main board (connect Pin ㉖ of IC801 to the GND) and turn on the power supply.

[MAIN BOARD] (SIDE A)

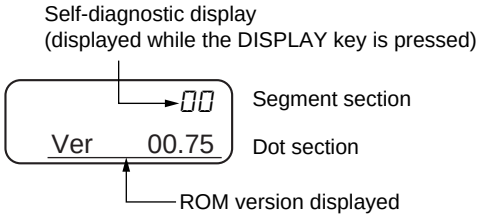


[Exiting the Test Mode]

Turn off the power supply and open the soldering bridge of TAP803 (TEST) on the main board.

[Operations When Test Mode is Set]

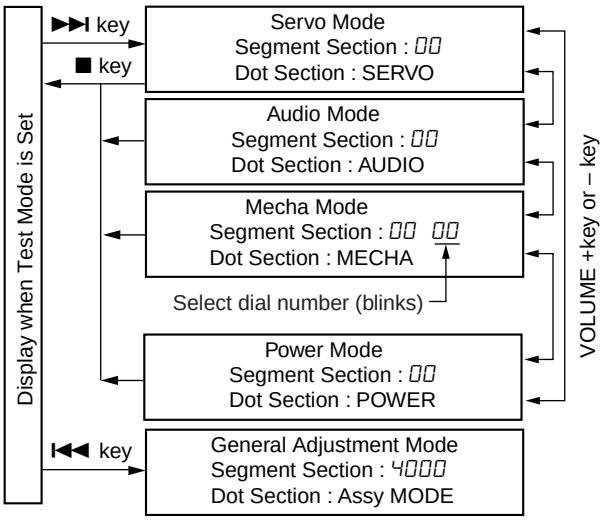
When the test mode is set, the LCD will display as follows.



- The LCD performs the following repeatedly.
  ROM version displayed ➡ all lit ➡ all off
- The display can be held and checked by pressing ❚❚key.
- The self-diagnostic display appears while the DISPLAY key is pressed.

[Structure of Test Mode]

The test mode of this unit consists of the following five modes.

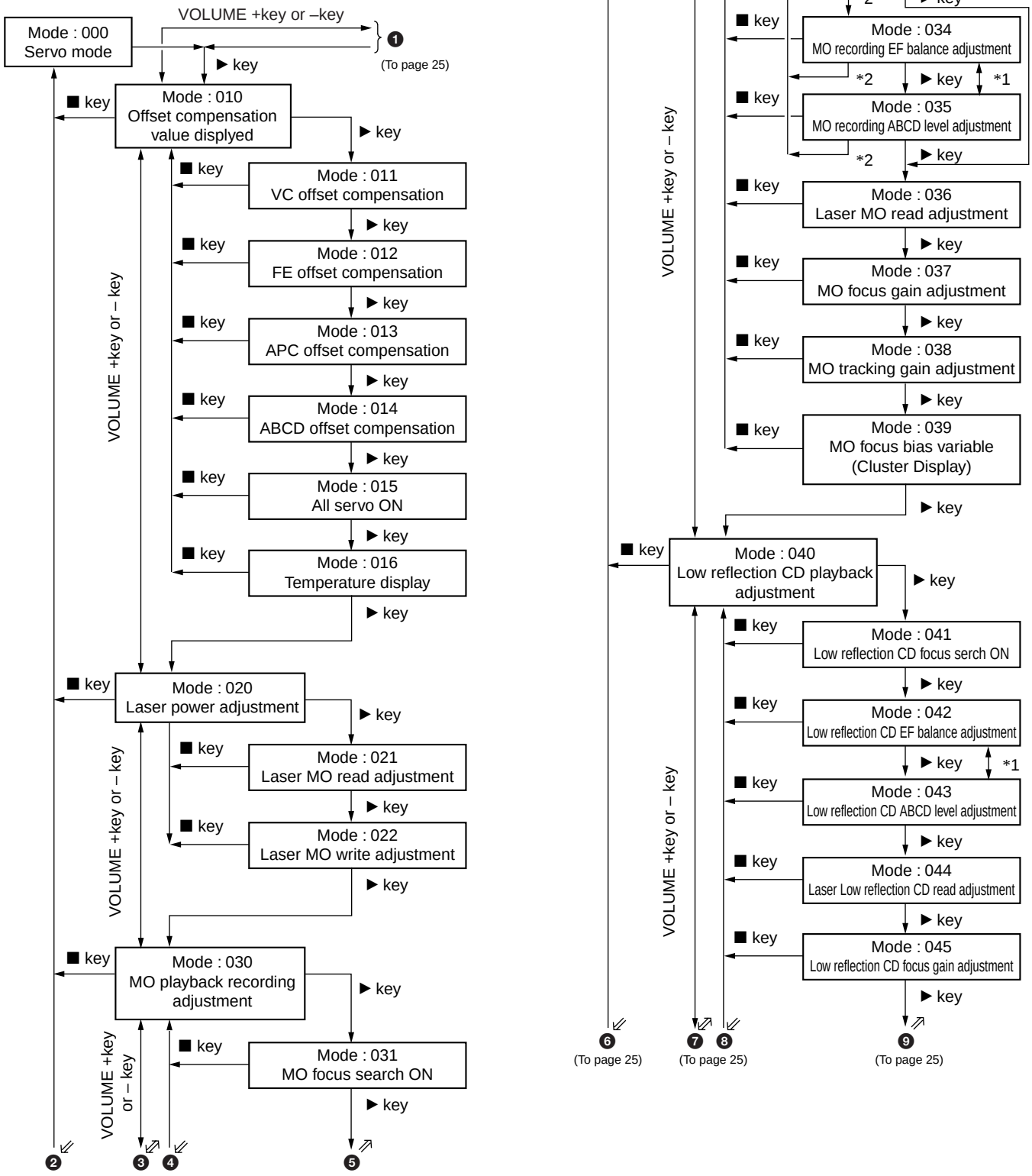


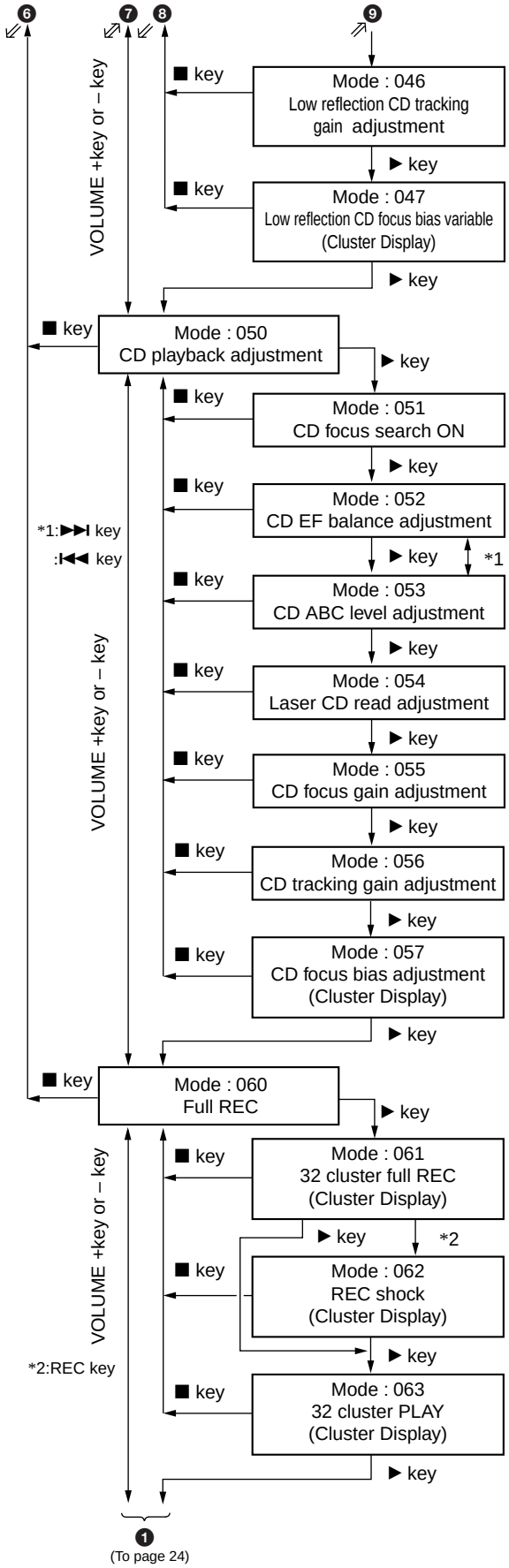
- In modes other than the general adjustment mode, the last two digits of the mode number will be displayed at the 00 section.

[Servo Mode]

- Set the test mode, press the ▶▶I key, and set the servo mode using the VOLUME + and – keys.
- When the servo mode is set, the optical pickup will move to the outer circumference or inner circumference if the ▶▶I key or I◀◀ key is pressed.
- To set other modes, refer to " Structure of Test Mode ".

• Structure of Servo Mode

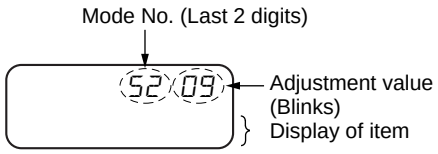




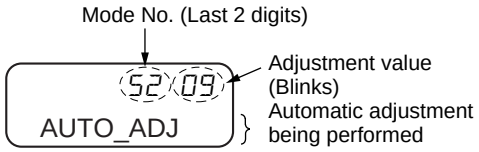
• Adjusting Method

Note : There is basically no display for individual adjustment items. Only such upper position titles as SERVO, AUDIO, etc. (100s position) are displayed.

1. When the adjustment modes are set according to "Structure of Servo Mode", the last two digits of the mode number and the adjustment value written in the EEPROM will be displayed blinking.

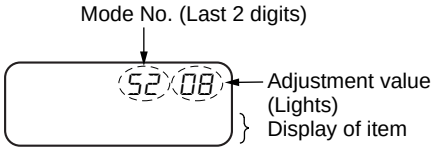


2. When the ▮▮key is pressed, the following will be displayed and adjustments will be performed automatically.

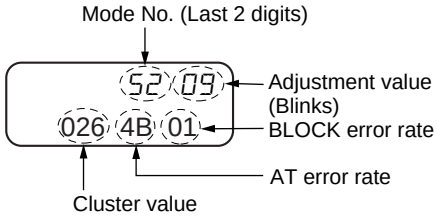


Note : The adjustment value can be changed as desired using the VOLUME + and – keys, but try to avoid this as much as possible.

3. After the adjustments are completed, the item is displayed again and the adjustment value that was blinking lights up.



• Cluster Display

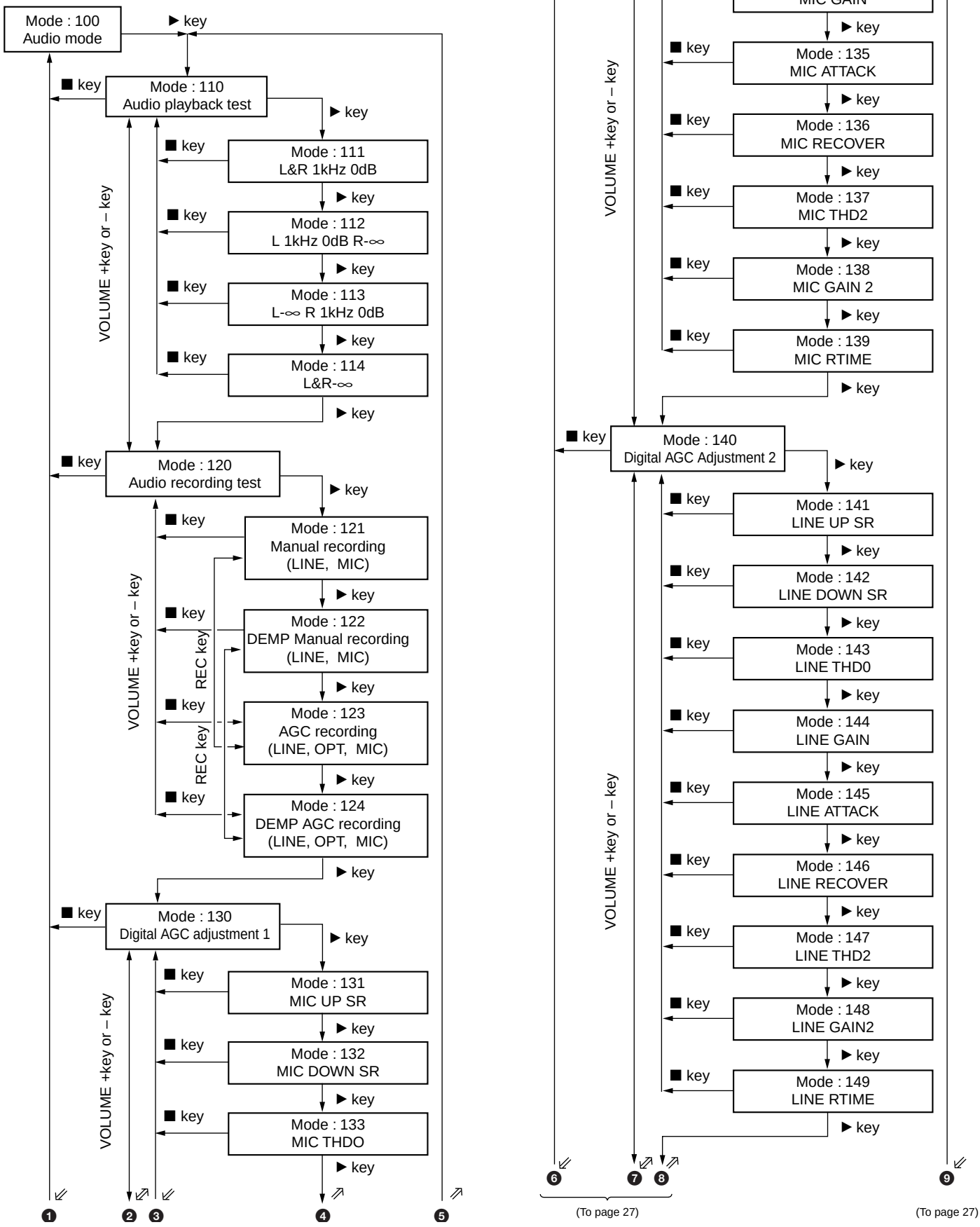


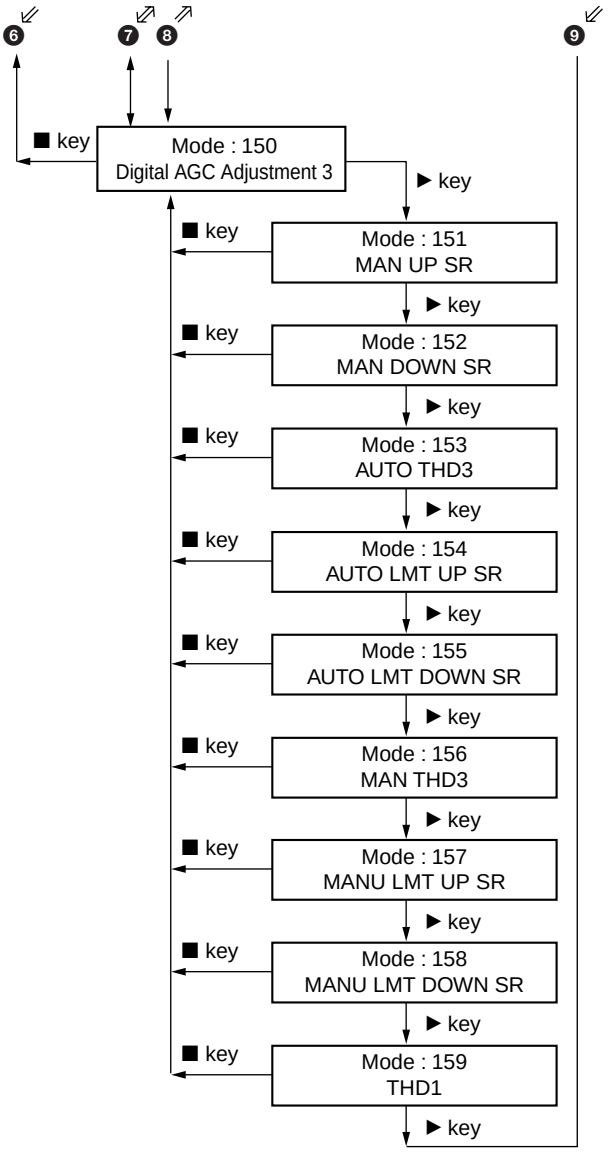
• Nothing is performed at mode numbers 070 to 073.

[Audio Mode]

- Set the test mode, press the ▶▶| key, and set the audio mode using the VOLUME + and – keys.
- To set other modes, refer to “Structure of Test Mode”.

- **Structuer of Audio Mode**



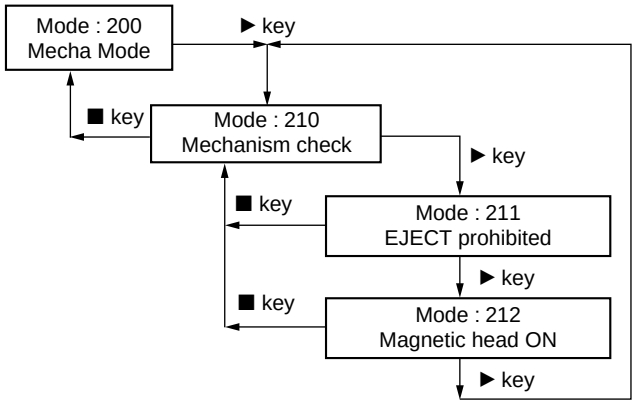


- When the ❚❚key is pressed at mode numbers 100, 110 to 114, the buzzer will sound.
- When the VOLUME keys + and – are pressed at mode numbers 111 to 113, 123, 124, the volume of the headphone output will increase/decrease.
  When the ⏮key or ⏭key is pressed, the volume of the headphone output will become maximum/minimum.
- When the VOLUME keys + and – are pressed at mode numbers 121 or 122, the recording level will increase/decrease.
  When the ⏮key or ⏭key is pressed, the recording level will become maximum/minimum.
- At mode numbers 121 to 124, the recording LED will light up.
- At mode numbers 121 to 124, the microprocessor will detect the port and automatically determine the input.

[Mecha Mode]

- Set the test mode, press the ⏭key, and set the mecha mode using the VOLUME + and – keys.
- To set other modes, refer to "Structure of Test Mode".

• Structure of Mecha Mode

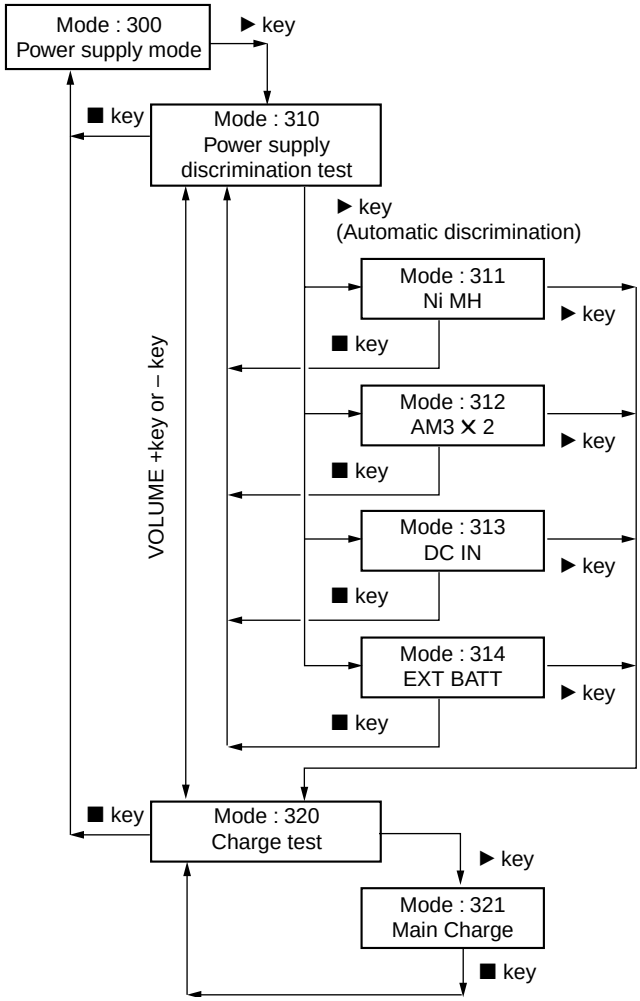


- At mode numbers 200, 210 to 212, the optical pick up can be moved to the outer circumference or inner circumference using the ⏮ or ⏭key.

[Power supply Mode]

- Set the test mode, press the ⏭key, and set the power supply mode using the VOLUME + and – keys.
- To set other modes, refer to "Structure of Test Mode".

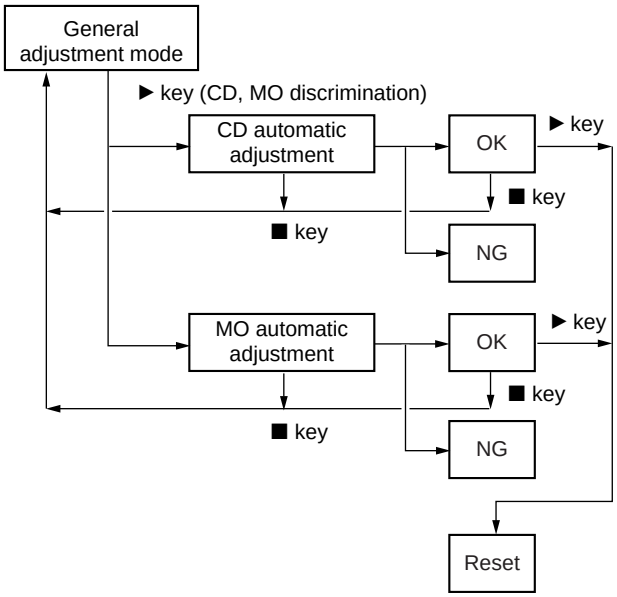
• Structure of Power Supply Mode



[General Adjustment Mode]

- Set the test mode, press the I◀◀ key, and set the general adjustment mode.
- To set other modes, cut off the power once and power on again.
- When the general adjustment mode is set, the LCD display will be as follows.

• Structure of General Adjustment Mode



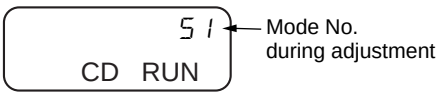
Adjusting Method :

1. Set the test mode, press the I◀◀ key to set the general adjustment mode.
2. Load the CD test disc (TDYS-1) or SONY MO disc available on the market.
3. When the ►key is pressed, the disc is determined if CD or MO, the automatic adjustment modes are set, and adjustments are performed automatically in the following order.

• CD Automatic Adjustment

No.	Mode No.	Adjustment
1	052	CD EF balance adjustment
2	053	CD ABCD level adjustment
3	055	CD focus gain adjustment
4	056	CD tracking gain adjustment
5	057	CD focus bias adjustment

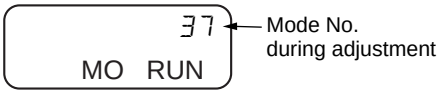
* Display during CD automatic adjustment



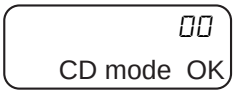
• MO Automatic Adjustment

No.	Mode No.	Adjustment
1	032	MO playback EF balance adjustment
2	033	MO playback ABCD level adjustment
3	034	MO recording EF balance adjustment
4	035	MO recording ABCD level adjustment
5	037	MO focus gain adjustment
6	038	MO tracking gain adjustment
7	061	32 cluster full REC
8	062	REC shock
9	063	32 cluster PLAY
10	039	MO focus bias adjustment
11	042	Low reflection CD EF balance adjustment
12	043	Low reflection CD ABCD level adjustment
13	045	Laser low reflection CD read adjustment
14	046	Low reflection CD tracking gain adjustment

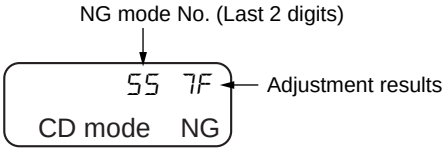
* Display during MO automatic adjustment



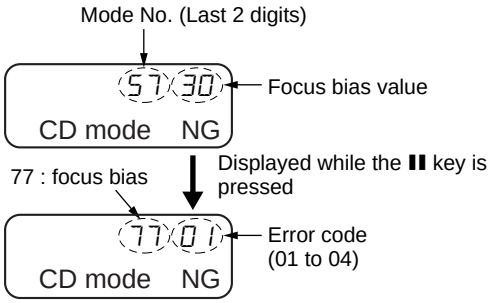
4. If the automatic adjustment results are OK, the following will be displayed.



5. If the automatic adjustment results are NG, the following will be displayed.

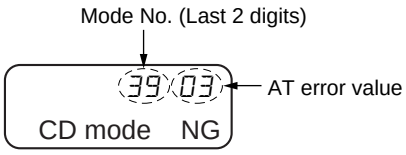


* When the mode number is 039, 057 and the focus bias value is NG, the following will be displayed.



SECTION 5
ELECTRICAL ADJUSTMENTS

* When the mode number is 039, 061 and the AT error rate is NG, the following will be displayed.



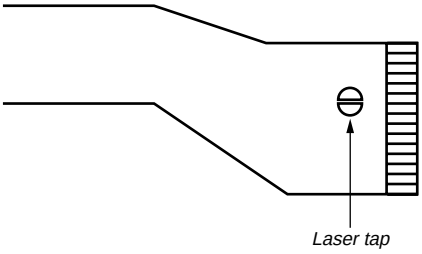
* When NG, set the servo mode and perform the automatic adjustment of the NG item. (Refer to “Servo Mode”)

5-1. Precautions for Laser Diode Emission Check

When checking the emission of the laser diode during adjustments, never view directly downwards as this may lead to blindness.

5-2. Precautions for Using Optical Pickup (KMS–250A/J2N)

As the laser diode inside the optical pickup damages by static electricity easily, solder the laser tap of the flexible board when handling. Also take the necessary measures to prevent damages by static electricity. Handle the flexible board with care as it breaks easily



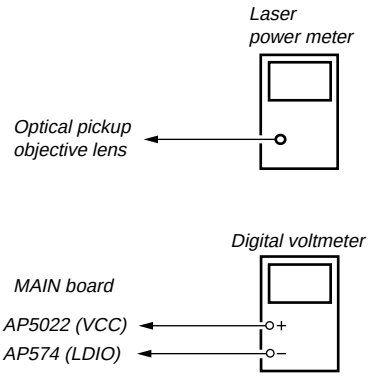
Optical Pickup flexible board

5-3. Precautions for Adjustment

1) Perform all adjustments in the order given in the test mode. After adjusting, exit the test mode.
2) Use the following tools and measuring instruments.
   - CD test disc TDYS-1 (Parts Code : 4-963-646-01)
   - Recorded MO disc PTDM-1 (Parts Code : J-2501-054-A)
   - Laser power meter LPM-1 (Parts Code : J-2501-046-A)
   - Oscilloscope (Frequency band above 40MHz. Perform the calibration of probe first before measuring.)
   - Digital voltmeter
3) Unless specified othewise, supply DC 6V from the DC IN 6V jack.
4) Swtich, knob positions
   Hold switch ..... OFF
   AVLS switch ..... OFF

5-4. Laser Power Check

Connection :

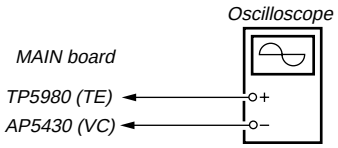


Adjusting Method :

1. Set the servo mode of the test mode (Mode : 000).
2. Press the ▶key, and set the laser power adjustment mode (Mode : 020) using the volume + and – keys.
3. Press the ⏮key and move the optical pickup to the inner most circumference.
4. Open the cover and set the laser power meter on the objective lens of the optical pickup.
5. Press the ▶key, and set the laser MO read adjustment mode (Mode : 021).
6. Check that the laser power meter reading is 0.85 ±0.085mW.
7. Check that the voltage between AP5022 (VCC) and AP574 (LDIO) at this time is below 44mV.
8. Press the ▶key, and set the laser MO write adjustment mode (Mode : 022).
9. Check that the laser power meter reading is 6.8 ±0.68mW.
10. Press the ❚❚key to finalize the adjustment data.
11. Check that the voltage between AP5022 (VCC) and AP574 (LDIO) at this time is below 88mV.
12. Press the ■key.
13. Exit the test mode.

5-5. MO Traverse Adjustment

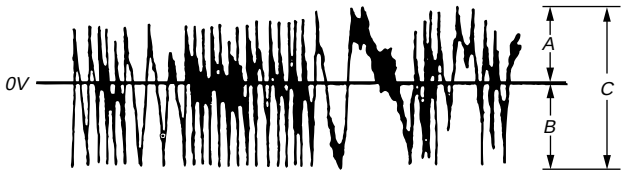
Connection :



Adjusting Method :

1. Set the servo mode of the test mode (Mode : 000).
2. Press the ▶key, and set the MO playback adjustment mode (Mode : 030) using the volume + and – keys.
3. Press the ⏮and ⏭keys and move the optical pickup to the center circumference.
4. Load any MO disc available on the market.
5. When the ▶key is pressed, the MO playback EF balance adjustment mode (Mode : 032) will be set after focus search ON (Mode : 031).
6. Press the ❚❚key to perform automatic adjustment, and check that the traverse waveform is symmetrical at the top and bottom.
7. Slide the recording key and set the MO recording EF balance adjustment mode (Mode : 034).
8. Press the ❚❚key to perform automatic adjustment, and check that the traverse waveform is symmetrical at the top and bottom.

(Traverse Waveform)



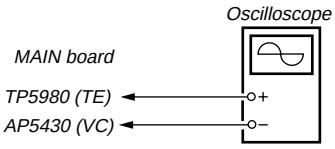
Specification : A = B, C ≧ 1.0 Vp-p

9. Check that the traverse level at this time is above 1.0Vp-p.
10. Press the ■key.
11. Exit the test mode.

Note : Using a recorded disc in this adjustment will erase the data.

5-6. Low Reflection CD Traverse Adjustment

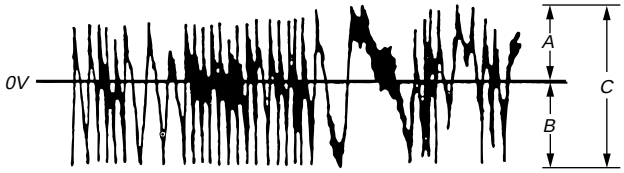
Connection :



Adjusting Method :

1. Set the servo mode of the test mode (Mode : 000).
2. Press the ▶key, and set the low reflection CD playback adjustment mode (Mode : 040) using the volume + and – keys.
3. Load any MO disc available on the market.
4. When the ▶key is pressed, the low reflection CD playback EF balance adjustment mode (Mode : 042) will be set after low reflection CD focus search ON (Mode : 041).
5. Press the ❚❚key to perform automatic adjustment, and check that the traverse waveform is symmetrical at the top and bottom.

(Traverse Waveform)

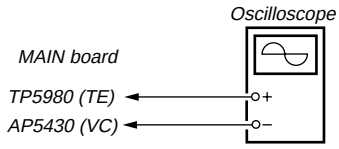


Specification : A = B, C ≧ 0.9 Vp-p

6. Check that the traverse level at this time is above 0.9Vp-p.
7. Press the ■key.
8. Exit the test mode.

5-7. CD Traverse Adjustment

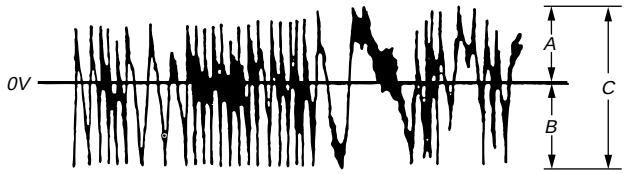
Connection :



Adjusting Method :

1. Set the servo mode of the test mode (Mode : 000).
2. Press the ▶key, and set the CD playback adjustment mode (Mode : 050) using the volume + and – keys.
3. Press the I◀◀ and ▶▶I keys and move the optical pickup to the center circumference.
4. Load a CD test disc (TDYS-1).
5. When the ▶key is pressed, the CD playback EF balance adjustment mode (Mode : 052) will be set after CD focus search ON (Mode : 051).
6. Press the ❚❚key to perform automatic adjustment, and check that the traverse waveform is symmetrical at the top and bottom.

(Traverse Waveform)

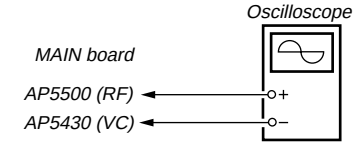


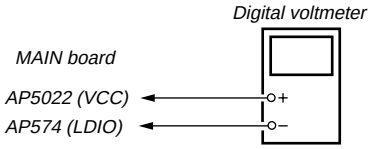
Specification : A = B, C ≧ 1.0 Vp-p

7. Check that the traverse level at this time is above 1.0Vp-p.
8. Press the ■key.
9. Exit the test mode.

5-8. CD RF Level Check

Connection :

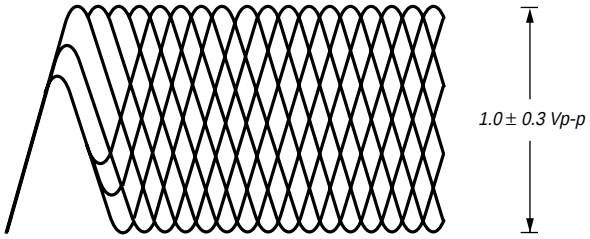




Adjusting Method :

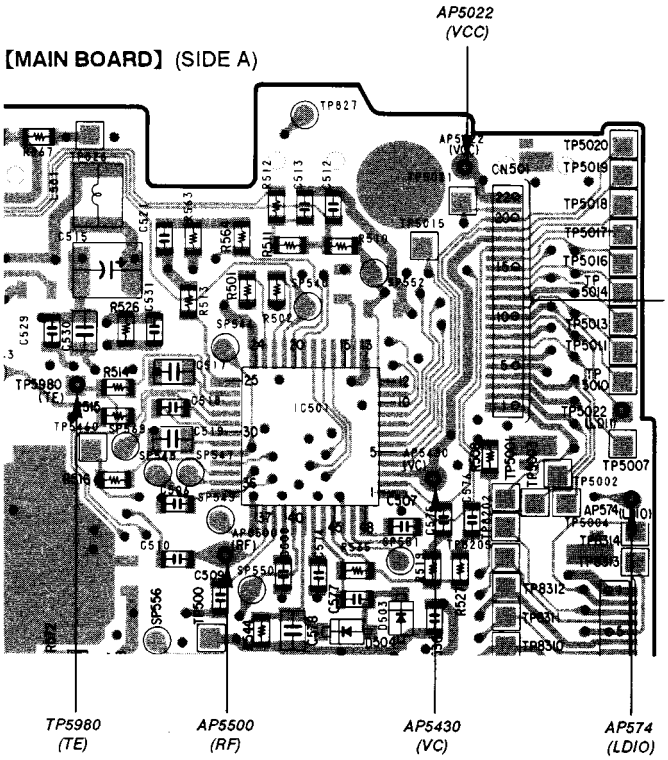
1. Set the servo mode of the test mode (Mode : 000).
2. Press the ▶key, and set the CD playback adjustment mode (Mode : 050) using the volume + and -keys.
3. Press the ⏮and ⏭keys and move the optical pickup to the center circumference.
4. Load a CD test disc (TDYS-1).
5. When the ▶key is pressed, the CD EF balance adjustment mode (Mode : 052) will be set after CD focus search ON (Mode : 051).
6. When the ▶key is pressed, the ABCD level adjustment mode (Mode : 053) is set.
7. Press the ⏸ key to perform automatic adjustment, and check that the RF level is 1.0 ±0.3Vp-p.

(RF waveform)



8. Check that the voltage between AP5022 (VCC) and AP574 (LDIO) at this time is below 44mV.
9. Press the ■key.
10. Exit the test mode.

Adjustment Location :



SECTION 6
EXPLANATION OF IC TERMINALS

IC503 DIGITAL SERVO, ATRAC (CXD2652R)

Pin No.	Pin name	I/O	Description
1	MNT 0	O	Traverse count signal output.
2	MNT 1	O	Track jump detect output.
3	MNT 2	–	Not used (Open).
4	MNT 3	–	Not used (Open).
5	SWDT	I	Inputs write data signal from system controller (IC801).
6	SCLK	I	Inputs serial clock signal from system controller (IC801).
7	XLAT	I	Inputs serial latch signal from system controller (IC801).
8	SRDT	O	Outputs write data signal to system controller (IC801).
9	SENS	O	Outputs internal status (SENSE) to system controller (IC801).
10	XRST	I	Inputs reset signal from system controller (IC801). Reset : L
11	SQSY	O	Output subcode Q sync (SCOR) to system controller (IC801). Outputs “L” every 13.3msec. Outputs “H” at all most mostly.
12	DQSY	O	Outputs digital-in U-bit CD format subcode Q sync (SCOR) to system controller (IC801). Outputs “L” every 13.3msec. Outputs “H” at all most mostly.
13	WRPWR	I	Inputs laser power switching signal from system controller (IC801).
14	NC	–	Not used (Open).
15	TX	I	Input of write data taransmission timing from system controller (IC801). Also used as magnetic field head ON/OFF output.
16	OSC1	O	Clock output (45MHz).
17	OSC0	I	Clock input (45MHz).
18	XTSL	–	Not used (Fixed at “L”)
19	RV_{DD}	–	Not used (Open).
20	RV_{SS}	–	Connect to ground.
21	DIN	I	Digital audio signal input pin (For optical input).
22	NC	–	Not used (Open).
23	ADDT	I	Audio data input from A/D converter (IC303).
24	DATA	O	Monitor/decode audio data output to A/D converter (IC303).
25	ALRCK	O	L/R clock output to D/A converter (IC303).
26	ABCK	O	Bit clock signal output to A/D, D/A converter (IC303).
27	FS256	O	11.2896MHz clock output (MCLK).
28	DV_{DD}	–	Power supply (+2.8V) for digital.
29 – 32	A03 – A00	O	Address signal output to RAM (IC509).
33	NC	–	Not used (Open).
34 – 38	A04 – A08	O	Address signal output to RAM (IC509).
39	NC	–	Not used (Open).
40	DV_{SS}	–	Ground terminal.
41	XOE	O	Output enable contol signal output to RAM (IC509).
42	XCAS	O	Column address strobe singal output to RAM (IC509).
43	A09	O	Address signal output to RAM (IC509).
44	XRAS	O	Row address strobe signal output to RAM (IC509).
45	XWE	O	Read/write control signal output to RAM (IC509).
46 – 49	D1 – D3	I	Data signal input from RAM (IC509).
50	MVCI	–	Not used (Connect to ground).
51	ASYO	O	Playback EFM full-swing output (L : VSS, H : VDD).
52	ASYI	I	Playback EFM asymmetry comparate voltage input.

Pin No.	Pin name	I/O	Description
53	AV_{DD}	–	Power supply (+2.8V) for analog.
54	BIAS	I	Playback EFM asymmetry circuit constant current input.
55	RFI	I	Inputs playback EFM RF signal from RF amplifier (IC501).
56	AV_{SS}	–	Ground terminal.
57	PDO	–	Not used (Open).
58	PCO	O	Decoder PLL master clock PLL phase comparison output.
59	FILI	I	Decoder PLL master clock PLL filter input.
60	FILO	O	Decoder PLL master clock PLL filter output.
61	CLTV	I	Decoder PLL master clock PLL VCO control voltage input.
62	PEAK	I	Inputs peak hold signal for light amount signal from RF amplifier (IC501).
63	BOTM	I	Inputs bottom hold signal for light amount signal from RF amplifier (IC501).
64	ABCD	I	Light amount signal from RF amplifier (IC501).
65	FE	I	Input focus error signal from RF amplifier (IC501).
66	AUX1	I	Input of auxiliary signal from RF amplifier (IC501).
67	VC	I	Input of middle point voltage (+1.4V) from RF amplifier (IC501).
68	ADIO	–	Not used (Open).
69	AV_{DD}	–	Power supply (+2.8V) for analog.
70	ADRT	–	Not used (Connect to +2.8V).
71	ADRB	–	Not used (Open).
72	AV_{SS}	–	Ground terminal.
73	SE	I	Input of sled error signal from RF amplifier (IC501).
74	TE	I	Input of tracking error signal from RF amplifier (IC501).
75	AUX2	–	Not used (Open).
76	DCHG	–	Not used (Connect to +2.8V).
77	APC	–	Not used (Connect to +2.8V).
78	ADFG	I	Input of ADIP dual FM signal from RF amplifier (IC501) (22.05kHz±1kHz). (TTL Schmidt input)
79	FO CONT	O	Focus control output to RF amplifier (IC501).
80	XLRF	I	Latch signal input from RF amplifier (IC501).
81	CKRF	O	RFCK clock (7.35kHz) signal output.
82	DTRF	I	Serial data input from system controller (IC801).
83	APCREF	I	Laser power setting signal input.
84	LDDR	–	Not used (Open).
85	TRDR	O	Tracking servo drive signal output (–).
86	TFDR	O	Tracking servo drive signal output (+).
87	DV_{DD}	–	Power supply (+2.8V) for digital.
88	FFDR	O	Focus servo drive signal output (+).
89	FRDR	O	Focus servo drive signal output (–).
90	FS4	O	176.4kHz clock signal output (MCLK).
91	SRDR	O	Sled servo drive signal output (–).
92	SFDR	O	Sled servo drive signal output (+).
93	SPRD	O	Spindle servo drive signal output (–).
94	SPFD	O	Spindle servo drive signal output (+).
95	FGIN	I	FG signal input from spindle motor driver (IC701).
96	TEST1	–	Not used (Connect to +2.8V).
97	TEST2	–	Not used (Connect to +2.8V).
98	TEST3	–	Not used (Connect to +2.8V).
99	DV_{SS}	–	Ground terminal.
100	EFMO	O	EFM recording signal ouput.

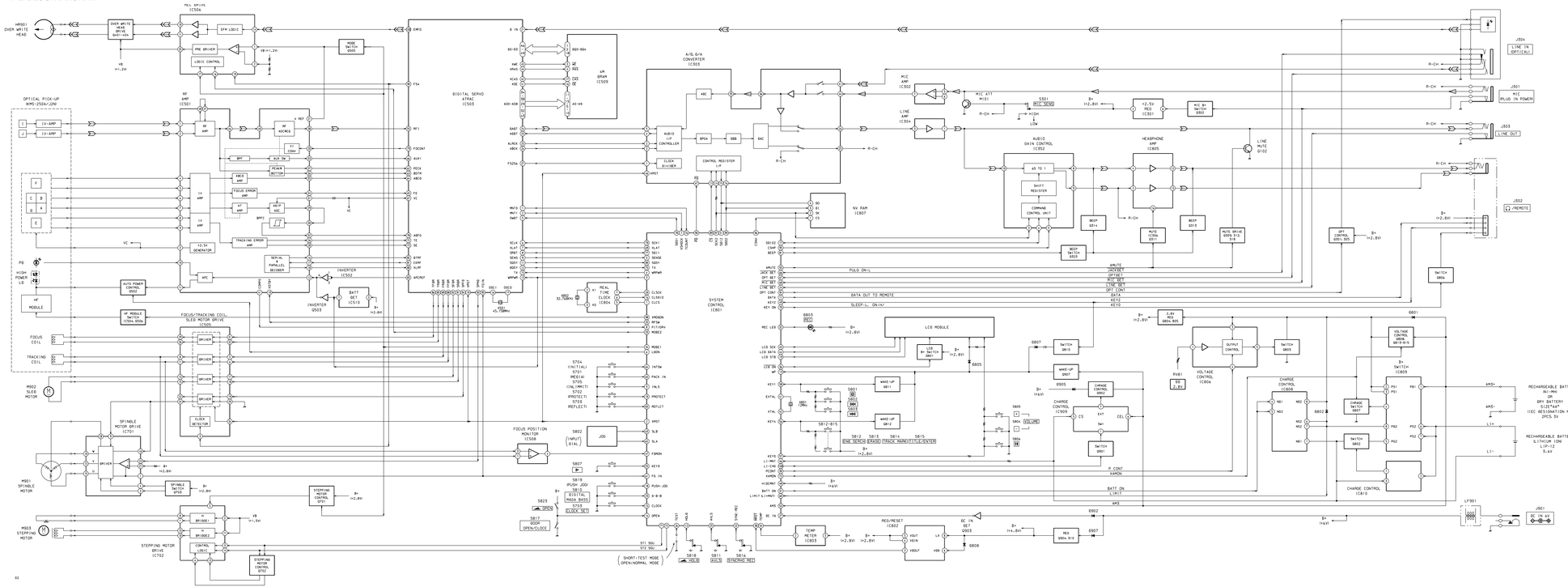
IC801 SYSTEM CONTROL(CXP81960M-632R)

Pin No.	Pin name	I/O	Description
1	CLCS	O	Chip select output to real time clock (IC804).
2	XRST	O	Reset output. L : Reset
3	WRPWR	–	Laser power switching signal output.
4	TX	O	Write data transfer timing output.
5	SENSE	I	Internal status (SENSE) input.
6	LDON	O	Laser ON signal. H : ON
7	XSHOCK	I	Track jump detection input.
8	PIT/GRV	I	COMP signal input from RF amplifier (IC501).
9	INLS	I	Detecting switch for internal circuit of sleding. Internal circuit : L
10	PROTECT	I	Disc write protect switch. H : Protect
11	DATA	O	Data output to remote control.
12	HOLD	I	Hold switch input (This unit). L : Hold
13	WP	I	Wake-up signal input from remote control key and this unit key.
14	OPEN	I	Detecting switch for opening and closing of the upper cover. Close : L
15	CLOCK	I	CLOCK SET switch input.
16	CLSDIO	I	Serial clock input.
17	SDIO2	I/O	Serial data input/output.
18	PUSH JOG	I	Push JOG switch input.
19	LCD STB	O	LCD standby ouput.
20	CLSCK	O	Serial clock output for real time clock (IC804).
21	SDI2	I	Serial data input.
22	SYNC. REC	I	SYNCHRO REC switch input.
23	D. B. B	I	DIGITAL MEGA BASS switch input.
24	$\overline{\text{LINEDET}}$	I	Line input detect. L : Line
25	AVLS	I	AVLS switch input. L : ON
26	TEST	I	Test mode terminal. L : Test mode
27	$\overline{\text{DCIN}}$	I	DC input detect. L : DC IN
28	KANASE L	–	Not used (Connect toground).
29	——	–	Not used (Open).
30	$\overline{\text{PCONT}}$	O	Power control output. L : ON
31	$\overline{\text{BATTON}}$	O	Outputs L while operating with a battery.
32	RECLED	O	REC LED control. L : ON
33	MODE2	O	Head drive (IC506) control signal output.
34	MODE1	O	
35	RFSW	O	Power control output to RF amplifier (IC501).
36	$\overline{\text{LCD ON}}$	O	LCD ON/OFF control. L : ON
37	MP	–	Microprocessor mode input (Fixed at “L”).
38	$\overline{\text{MRST}}$	I	Microprocessor reset input.
39	Vss	–	Ground.
40	XTAL	–	System clock (12MHz).
41	EXTAL	–	System clock (12MHz).
42	CS	–	Chip Select input (Connected to +2.8V).
43	——	–	Not used (Fixed at “L”).
44	LCDDATA	O	LCD data output.
45	LCDSCK	O	Serial clock output.
46	LI-MNT	I	Voltage monitor for lithium battery.
47	FDMON	I	Focus coil position monitor input.
48	HIDCMNT	I	Voltage monitor DC input.
49	KEY2	I	Remote control key input.
50	AVss	–	A/D converter ground terminal.

Pin No.	Pin name	I/O	Description
51	AVREF	I	A/D converter reference voltage input.
52	AV_{DD}	–	A/D converter power supply terminal.
53	AM3	I	AC adaptor or EXT battery detection input. L : EXT battery
54	TEMP	I	Temp meter (IC803) input.
55	KEY3	I	PLAY Key input.
56	KEY4	I	Key input.
57	KEY0	I	Key input.
58	KEY1	I	Key input.
59	UNMNT (LI+MNT)	I	UNREG voltage monitor.
60	LIMIT (LI+MNT)	I	Voltage monitor for lithium battery.
61	FGIN	I	FG input from motor driver (IC701).
62	SLA	I	JOG dial signal input.
63	SLB	I	
64	INTSW	I	INITIAL switch input.
65	PACK IN	I	MEDIA switch input.
66	$\overline{\text{JACKDET}}$	I	Input jack detection input.
67	OPT DET	I	Detecting input an optical input.
68	MICDET	I	MIC jack detection.
69	XLAT	O	Latch output.
70	KEYON	O	TRACK MARK jack input.
71	ST1SOU	O	Stepping motor signal output.
72	ST2SOU	O	
73	XAMON	O	Charge current control.
74	——	–	Not used (Open).
75	DQSY	I	Subcode Q sync (SCOR) of digital in U-bit CD format from IC503.
76	TCOUNT	I	Traverse count signal input.
77	SDI1	I	Serial data input.
78	SDO1	O	Serial data output.
79	SCK1	O	Serial clock output.
80	SQSY	I	SUB-Q/ADIP SYNC input.
81	BEEP	O	BEEP sound output control. H : BEEP sound output
82	——	–	Not used (Open).
83	REFLCT	I	CD/MO discrimination switch.
84	TEX	–	Not used (Fixed at “L”)
85	XT	–	Not used (Open).
86	V_{SS}	–	Ground.
87	V_{DD}	–	Power supply pin (+2.8V).
88	NC	–	Not used (Fixed at “H”)
89	$\overline{\text{CS}}$	I	Chip select input.
90	$\overline{\text{PD}}$	O	D/A converter power down detect during recording. H : Power down
91	——	–	Not used (Open).
92	——	–	Not used (Open).
93	AMUTE	O	Analog mute control. L : Mute
94	OPTCONT	O	Power supply control output for an optical input.
95	CSHP	O	Chip select output.
96	CSNV	O	
97	SCK2	O	Serial clock output.
98	XMODON	O	HF module control output.
99	SDO2	O	Serial data output.
100	LI–CHG	O	Charge control. H : Charge

SECTION 7
DIAGRAMS

7-1. BLOCK DIAGRAM

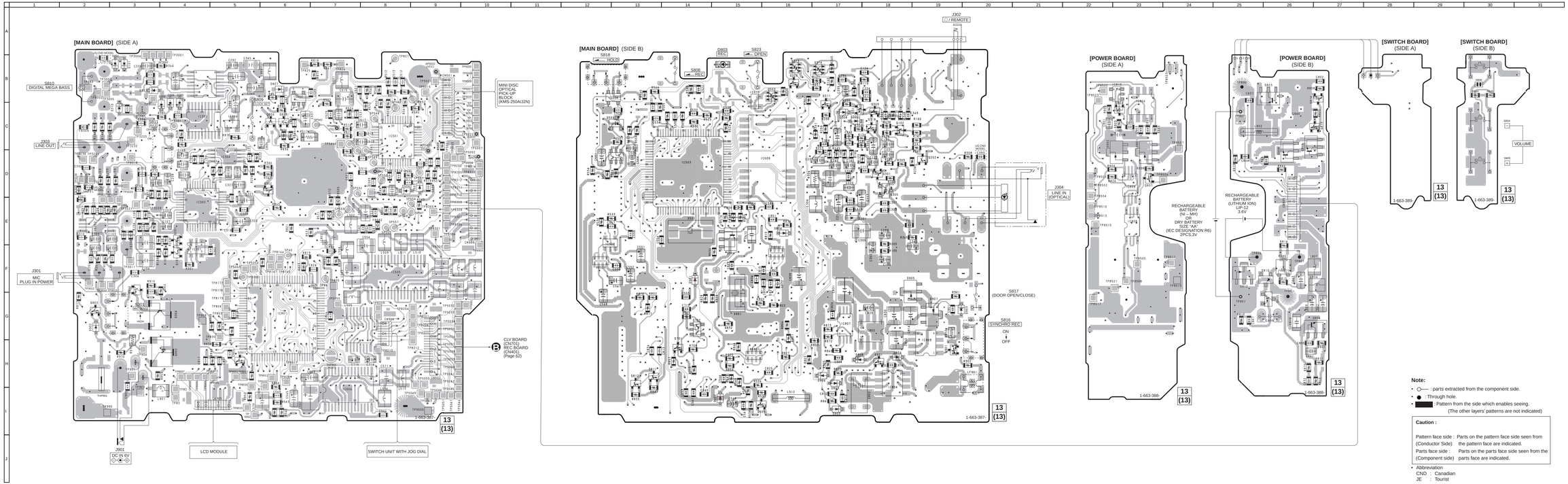


7-2. CIRCUIT BOARDS LOCATION

7-3. PRINTED WIRING BOARDS – MAIN SECTION –

● SEMICONDUCTOR LOCATION

Ref. No.	Location	Ref. No.	Location
D101	B-3	IC805	B-4
D201	B-3	IC806	B-23
D301	E-17	IC807	G-17
D303	C-4	IC808	E-23
D304	B-4	IC809	D-23
D305	C-4	IC810	B-23
D307	B-3	IC909	G-19
D308	C-17		
D310	C-3		
D501	F-14	Q101	E-4
		Q102	C-18
D502	H-15	Q201	E-4
D503	D-9	Q202	D-19
D504	D-8	Q301	D-18
D801	C-23		
D802	C-23	Q302	D-6
		Q305	D-18
D803	B-15	Q309	C-18
D804	E-16	Q311	B-17
D805	I-17	Q312	C-17
D806	H-18		
D807	B-6	Q313	B-16
		Q314	B-17
D808	H-17	Q318	C-18
D809	H-17	Q320	B-16
D810	F-26	Q502	D-13
D812	F-25		
D902	G-2	Q503	B-16
		Q504	E-15
D903	G-19	Q505	H-15
D905	F-18	Q506	C-13
D906	H-17	Q701	G-14
D907	G-19		
D3001	C-17	Q702	G-14
		Q801	H-18
		Q802	B-23
IC301	E-4	Q803	B-26
IC302	E-2	Q804	G-26
IC303	E-4		
IC304	D-5	Q805	F-26
IC306	C-5	Q806	C-6
		Q807	D-23
IC352	C-4	Q808	C-26
IC501	C-8	Q810	C-6
IC502	B-6		
IC503	D-14	Q811	H-13
IC504	B-13	Q812	H-13
		Q813	C-27
IC505	F-8	Q814	B-27
IC506	H-7	Q815	C-26
IC508	E-12		
IC509	D-16	Q901	G-19
IC510	B-15	Q902	G-4
		Q903	G-2
IC702	G-8	Q904	G-4
IC801	G-6	Q907	H-5
IC802	G-18		
IC803	E-7	Q910	F-3
IC804	H-18		



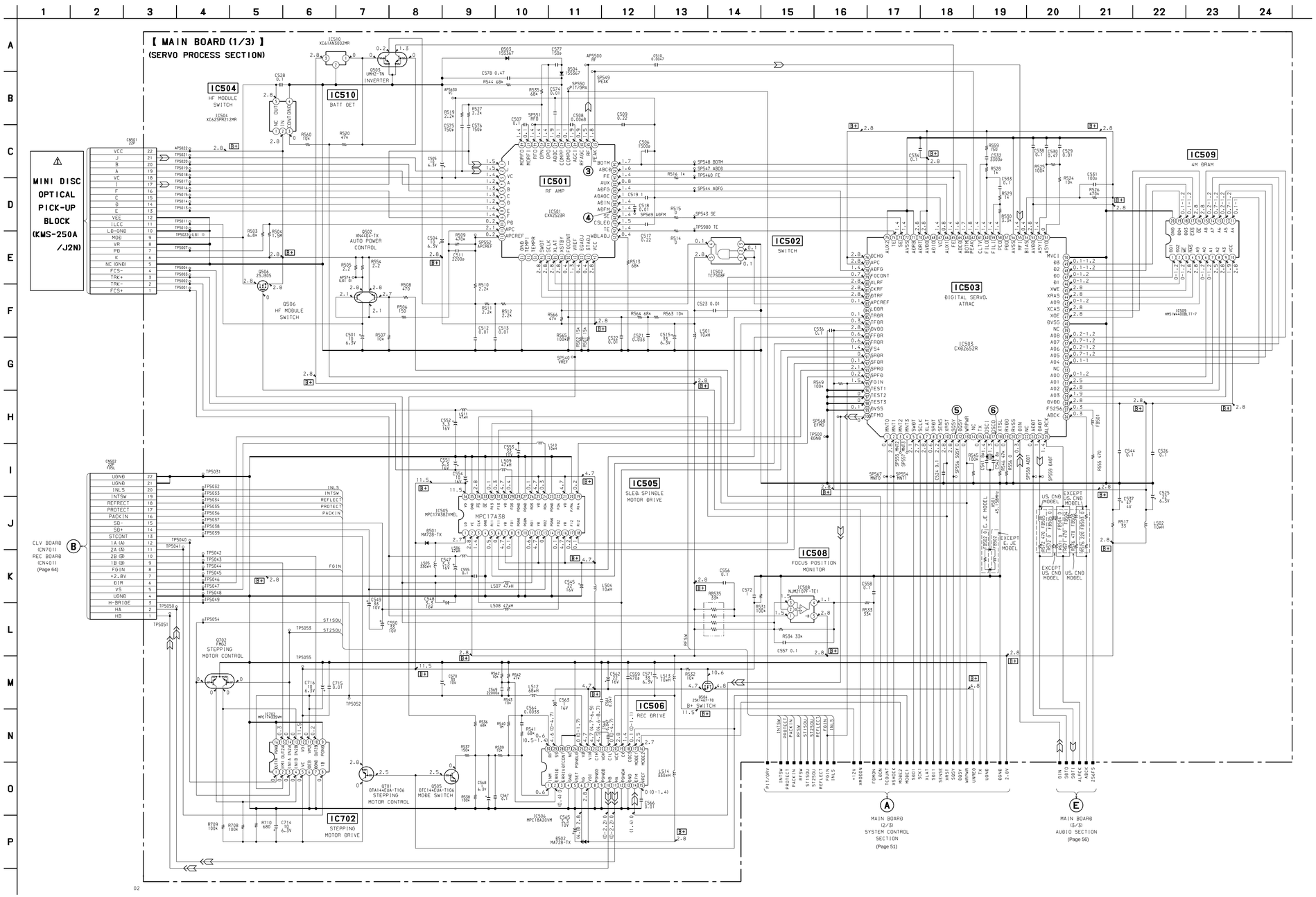
Note:

- ○— : parts extracted from the component side.
- ● : Through hole.
- ■ : Pattern from the side which enables seeing. (The other layers' patterns are not indicated)

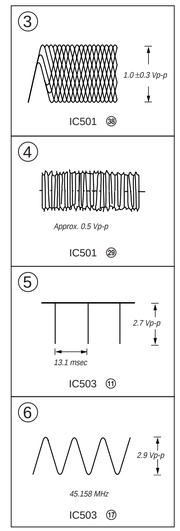
Caution :

Pattern face side : Parts on the pattern face side seen from (Conductor Side) the pattern face are indicated.
Parts face side : Parts on the parts face side seen from the (Component side) parts face are indicated.

- Abbreviation
  CND : Canadian
  JE : Tourist



● WAVEFORMS



Note :

- All capacitors are in μF unless otherwise noted. pF: μμF 50WV or less are not indicated except for electrolytics and tantaliums.
- All resistors are in Ω and 1/4W or less unless otherwise specified.
- **B+** : B+ Line
- Power voltage is dc 6V and fed with regulated dc power supply from external power voltage jack (J901).
- Voltage and waveforms are dc with respect to ground under no-signal conditions.
  no mark : PB
  ( ) : REC
- Voltages are taken with a VOM (Input impedance 10MΩ). Voltage variations may be noted due to normal production tolerances.
- Waveforms are taken with a oscilloscope. Voltage variations may be noted due to normal production tolerances.
- Circled numbers refer to waveforms.
- Signal path.
  : PB
  : REC
- Abbreviation
  CND : Canadian
  JE : Tourist

7-5. SCHEMATIC DIAGRAM – MAIN (2/3) SECTION –

● Refer to page 67 for IC Block Diagrams.

● WAVEFORMS

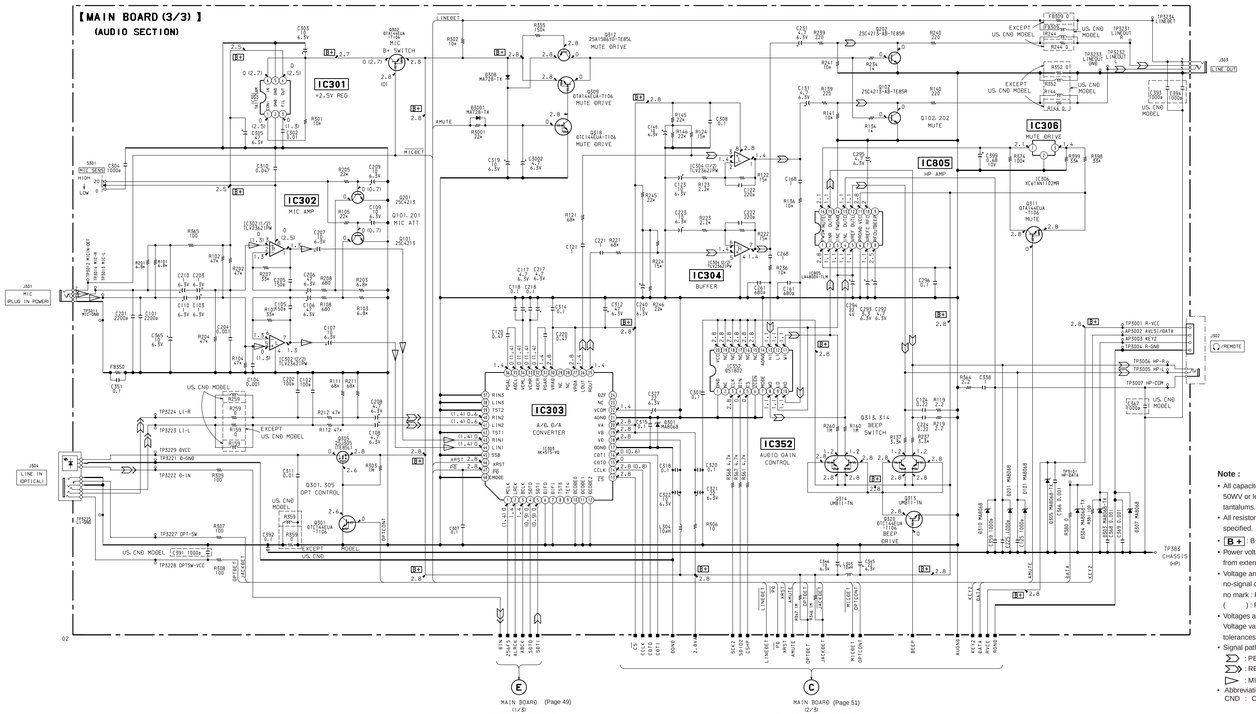
①
2.1 Vp-p
1.2 MHz
IC801 (46)

②
0.7 Vp-p
32.768 kHz
IC804 (2)

【 MAIN BOARD (2/3) 】
(SYSTEM CONTROL SECTION)

IC803 TEMP METER
IC802 RESET
IC801 SYSTEM CONTROL
IC801 CXP81SP50MR-4
IC804 REAL TIME CLOCK
IC909 CHARGE CONTROL
IC807 EEPROM AK93C45L-V-L NV-RAM
Q804 810 KEY CONTROL
Q904 910 UNREG LIMITTER
Q901 DTC144EUA-T106 CHARGE SWITCH
Q902 MAT11-TX DC-IN DETECT
Q903 DTC144EUA-T106 DC-IN DETECT
Q907 DTC144EUA-T106 WAKE-UP
Q801 BTA144EUA-T106 LCD B+ SWITCH
Q905 2SC2412K-TL-E 2.5V REGULATOR
Q906 2SB1386-QR 3.3V REGULATOR
Q908 2SD2118-Z CHARGE CONTROL
Q909 2SC4215-AB WAKE-UP
Q910 2SC4215-AB WAKE-UP
Q911 2SC4215-AB
Q912 2SC4215-AB
Q913 2SC4215-AB
Q914 2SC4215-AB
Q915 2SC4215-AB
Q916 2SC4215-AB
Q917 2SC4215-AB
Q918 2SC4215-AB
Q919 2SC4215-AB
Q920 2SC4215-AB
Q921 2SC4215-AB
Q922 2SC4215-AB
Q923 2SC4215-AB
Q924 2SC4215-AB
Q925 2SC4215-AB
Q926 2SC4215-AB
Q927 2SC4215-AB
Q928 2SC4215-AB
Q929 2SC4215-AB
Q930 2SC4215-AB

● Refer to page 68 for IC Block Diagrams.



● SEMICONDUCTOR LOCATION

Ref. No.	Location
D401	A-11
D402	B-12
IC701	B-7
Q401	B-11
Q402	A-11
Q403	B-12
Q404	A-12
Q703	B-2

Note:

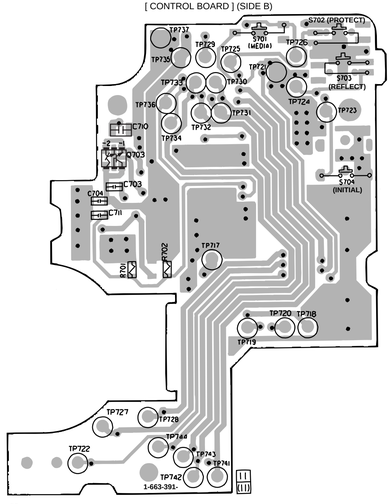
- ○— : parts extracted from the component side.
- ● : Through hole.
- ■■■ : Pattern from the side which enables seeing. (The other layers' patterns are not indicated)

Caution :

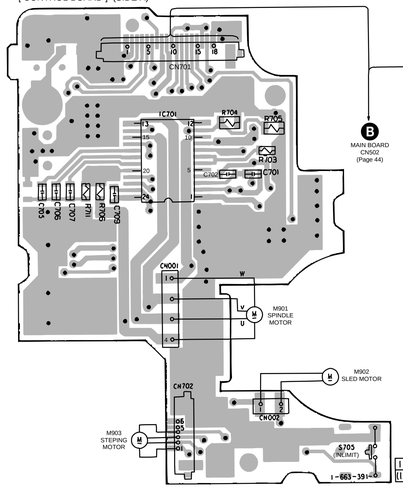
Pattern face side : Parts on the pattern face side seen from (Conductor Side) the pattern face are indicated.
Parts face side : Parts on the parts face side seen from the (Component side) parts face are indicated.

7-8. PRINTEDWIRING BOARDS – CONTROLSECTION –

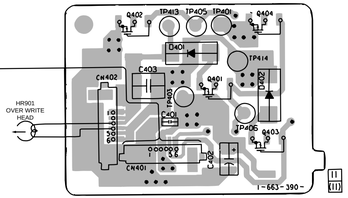
[CONTROL BOARD] (SIDE B)



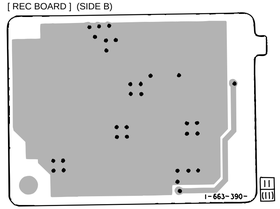
[CONTROL BOARD] (SIDE A)



[REC BOARD] (SIDE A)

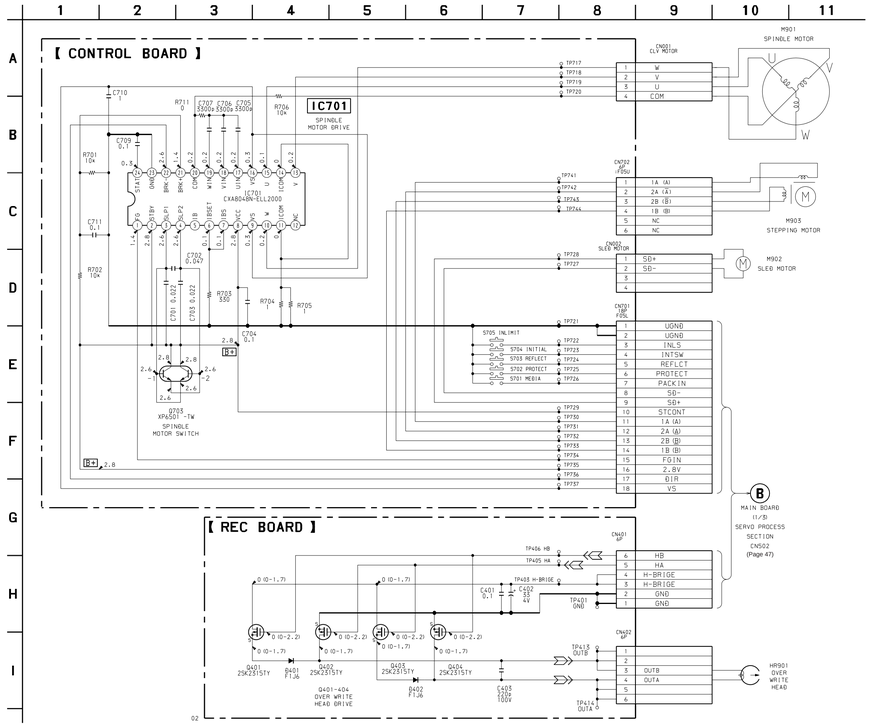


[REC BOARD] (SIDE B)



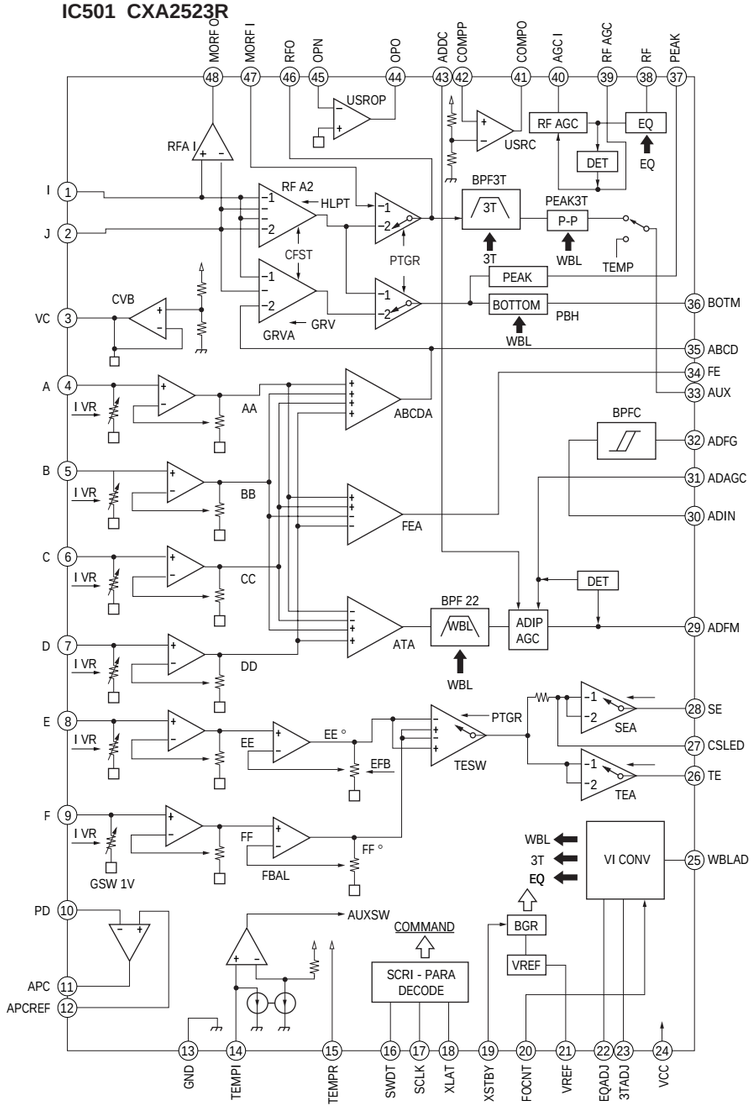
Note :

- All capacitors are in μF unless otherwise noted. pF: μμF 50WV or less are not indicated except for electrolytics and tantalums.
- All resistors are in Ω and 1/4-W or less unless otherwise specified.
- B+ Line
- Power voltage is dc 6V and fed with regulated dc power supply from external power voltage jack (J901).
- Voltage and waveforms are dc with respect to ground under no-signal conditions.
  no mark : PB
  ( ) : REC
- Voltages are taken with a VOM (Input impedance 10MΩ). Voltage variations may be noted due to normal production tolerances.

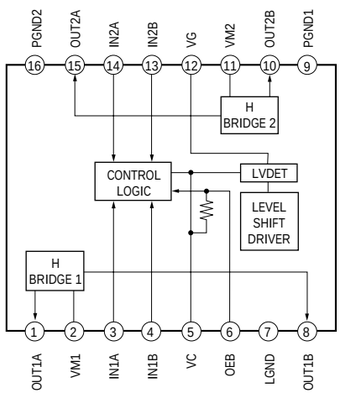


● IC BLOCK DIAGRAM – MAIN (1/3) SECTION –

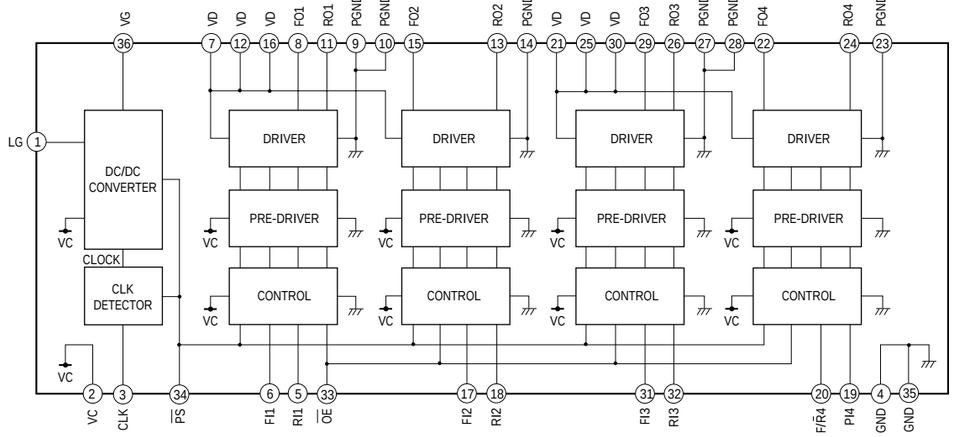
IC501 CXA2523R



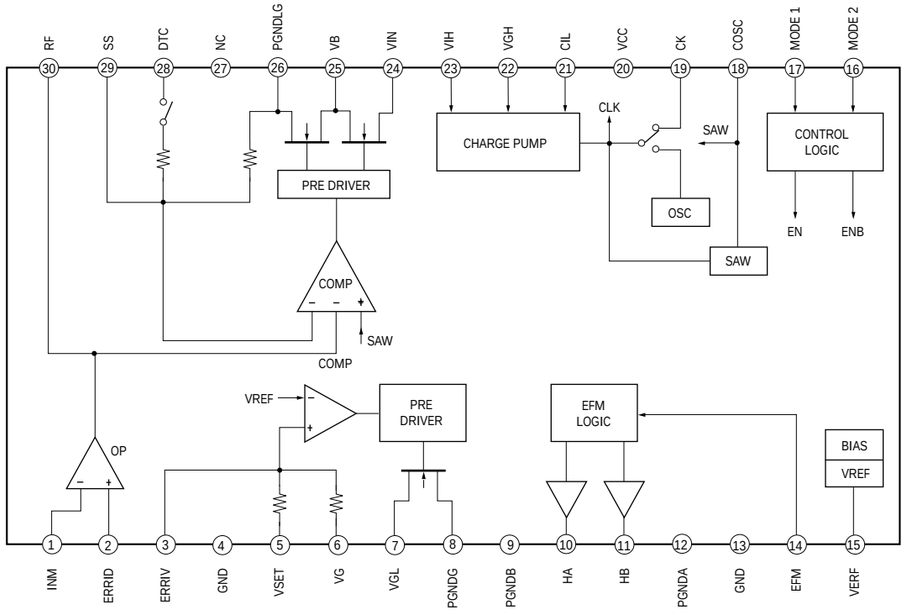
IC702 MPC17A33SVMEL



IC505 MPC17A38VMEL

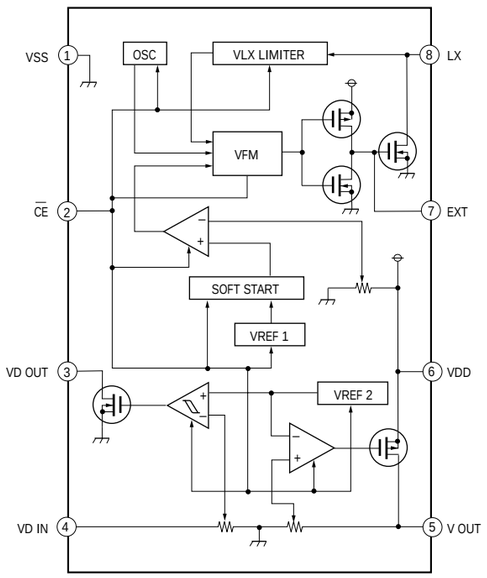


IC506 MPC18A20VMEL

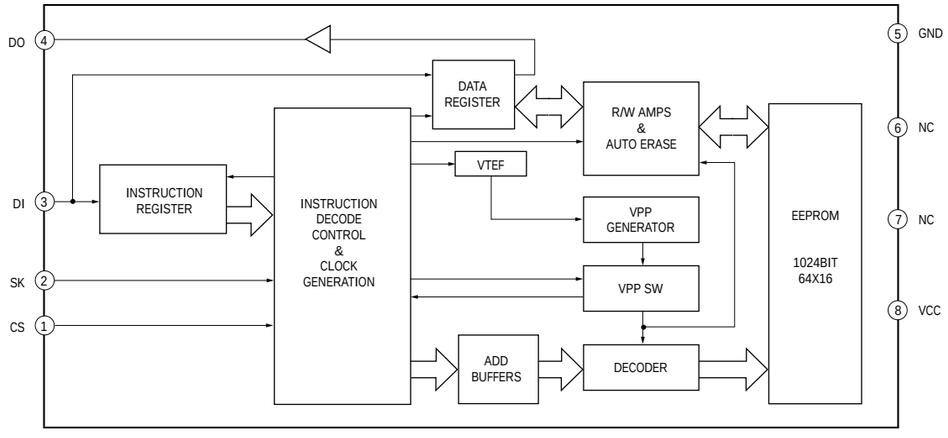


● IC BLOCK DIAGRAM – MAIN (2/3) SECTION –

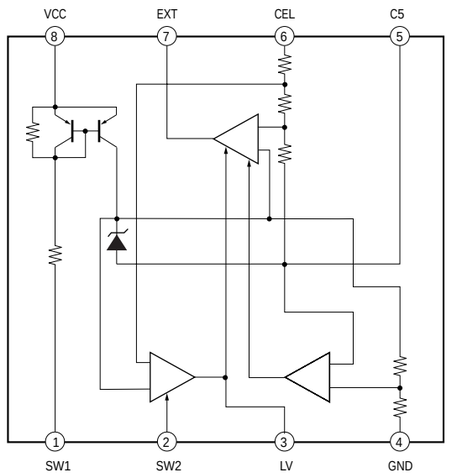
IC802 RS5RJ29261-T1



IC807 AK93C45LV-L

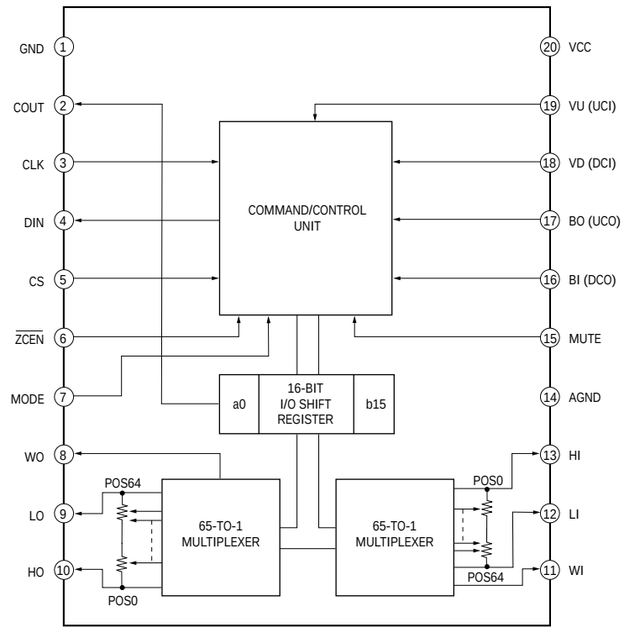


IC909 MM1332DFBE

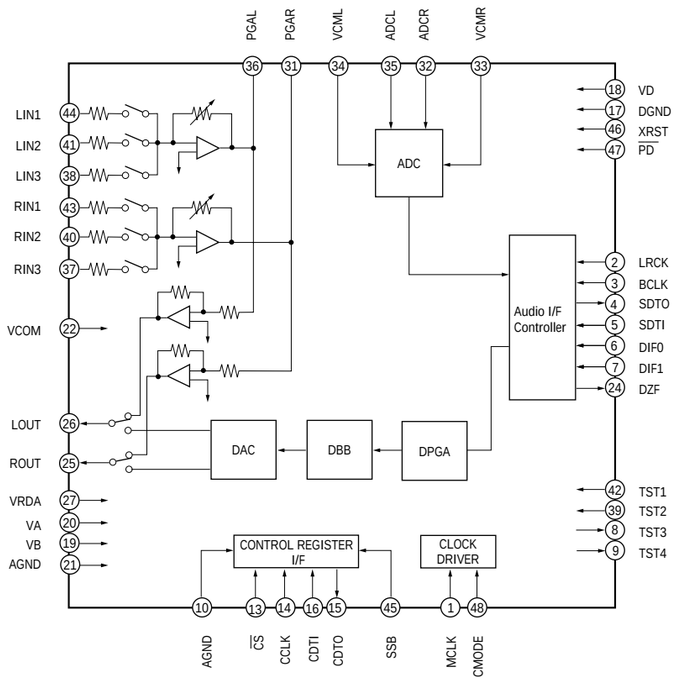


● IC BLOCK DIAGRAM – MAIN (3/3) SECTION –

IC352 DC1802E-TE2



IC303 AK4515-VQ



SECTION 8
EXPLODED VIEWS

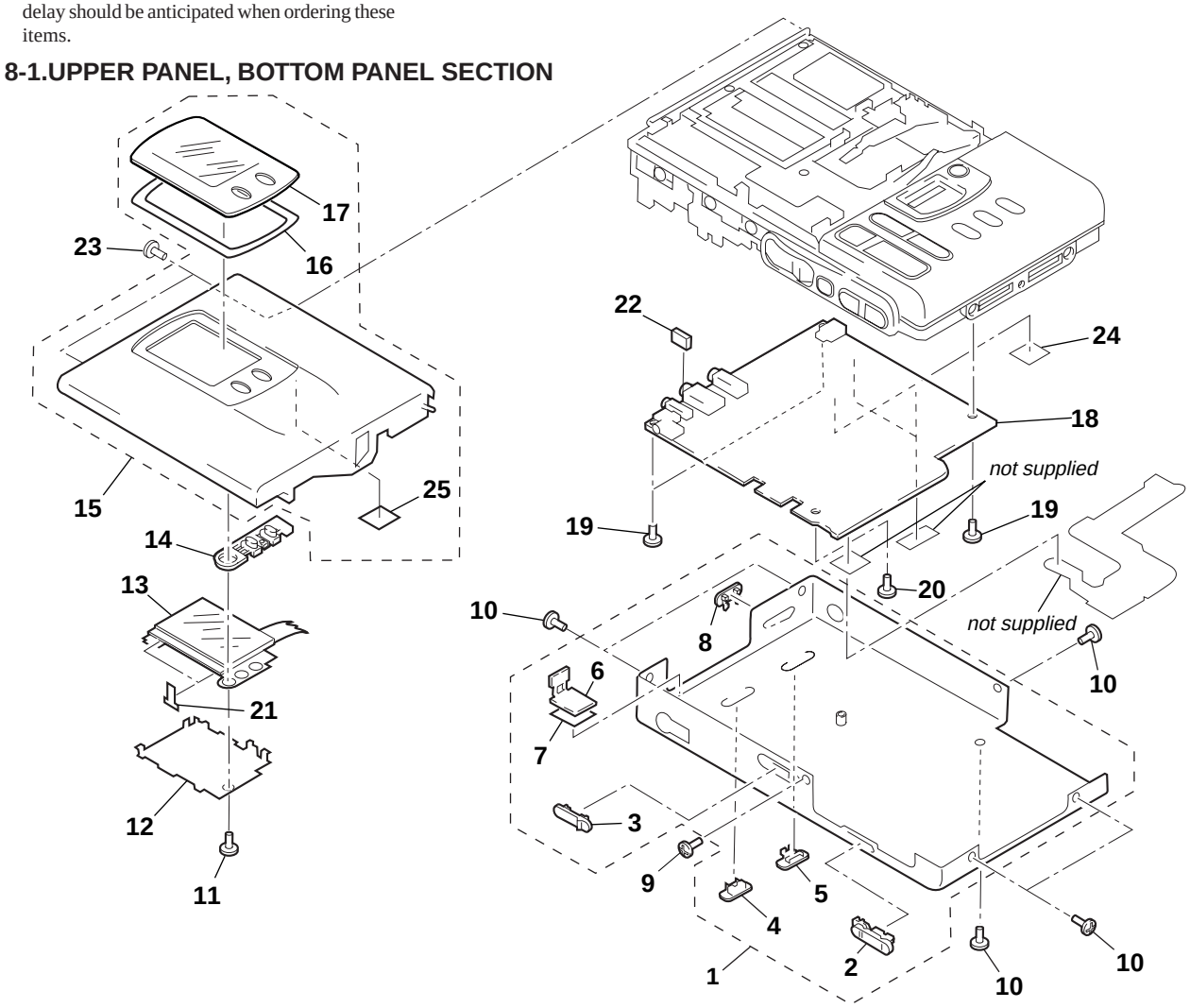
NOTE :

- -XX, -X mean standardized parts, so they may have some difference from the original one.
- Color indication of Appearance Parts
  Example :
  KNOB, BALANCE (WHITE) ••• (RED)
  ↑ ↑
  Parts color Cabinet's color
- Items marked " * "are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.
- The mechanical parts with no reference number in the exploded views are not supplied.
- Hardware (# mark) list and accessories and packing materials are given in the last of this parts list.
- Abbreviation
  CND : Canadian
  AUS : Australian

The components identified by mark ⚠ or dotted line with mark ⚠ are critical for safety.
Replace only with part number specified.

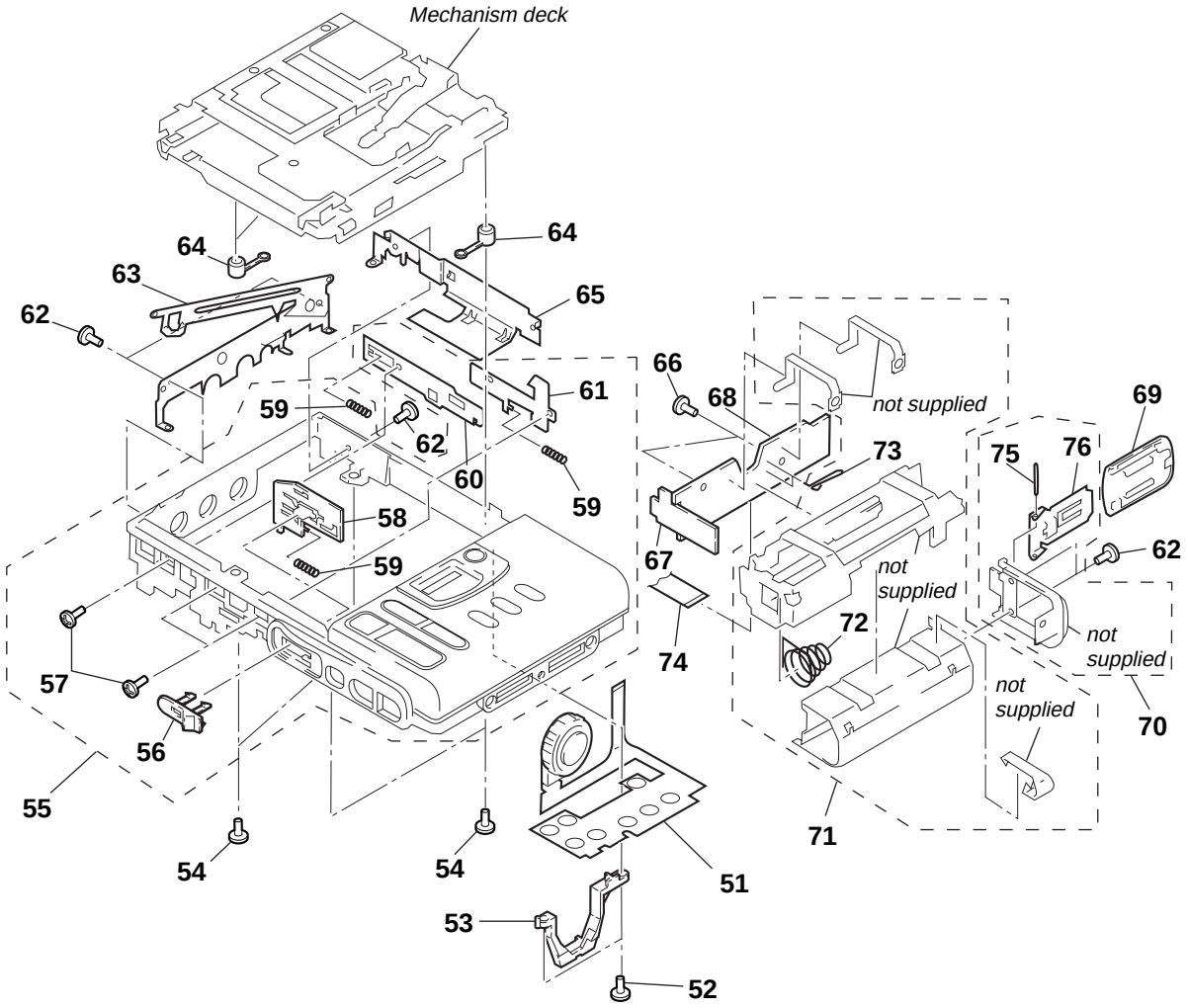
Les composants identifiés par une marque ⚠sont critiques pour la sécurité.
Ne les remplacer que par une pièce portant le numéro spécifié.

8-1.UPPER PANEL, BOTTOM PANEL SECTION



Ref. No.	Part No.	Description	Remark
1	X-4947-770-1	PANEL ASSY, BOTTOM	
2	4-986-207-01	KNOB (TUN)	
3	4-983-999-01	KNOB (OPEN)	
4	4-972-492-11	KNOB (AVLS)	
5	4-963-851-11	KNOB (AVLS)	
6	4-986-204-01	BUTTON (DBB)	
7	4-986-205-01	SHEET (DBB), ADHESIVE	
8	4-984-000-01	KNOB (DBB)	
9	4-984-017-11	SCREW (1.7X2.5), TAPPING	
10	4-963-883-41	SCREW (M1.4), PRECISION PAN	
11	4-963-883-21	SCREW (M1.4), PRECISION PAN	
12	4-986-190-01	HOLDER (LCD)	
13	1-801-522-11	LCD MODULE	
14	4-986-189-01	BUTTON (DISP)	
15	X-4947-769-1	PANEL ASSY, UPPER	
16	4-986-185-01	SHEET (LCD WINDOW), ADHESIVE	
17	4-986-184-11	WINDOW (LCD)	
18	A-3293-312-A	MAIN BOARD, COMPLETE (E, Tourist)	
18	A-3293-360-A	MAIN BOARD, COMPLETE (AEP, UK, AUS)	
18	A-3293-361-A	MAIN BOARD, COMPLETE (US, CND)	
19	3-335-797-91	SCREW (M1.4), TOOTHED LOCK	
20	3-375-114-21	SCREW (M1.7X2.5)	
* 21	4-988-279-01	CUSHION (LCD)	
* 22	4-988-280-01	CUSHION	
23	4-963-883-21	SPACER (M1.4), PRECISION PAN···(SILVER)	
23	4-963-883-31	SPACER (M1.4), PRECISION PAN···(BLUE)	
24	3-831-441-11	CUSHION (A)	
* 25	4-988-105-01	CUSHION (HEAD)	

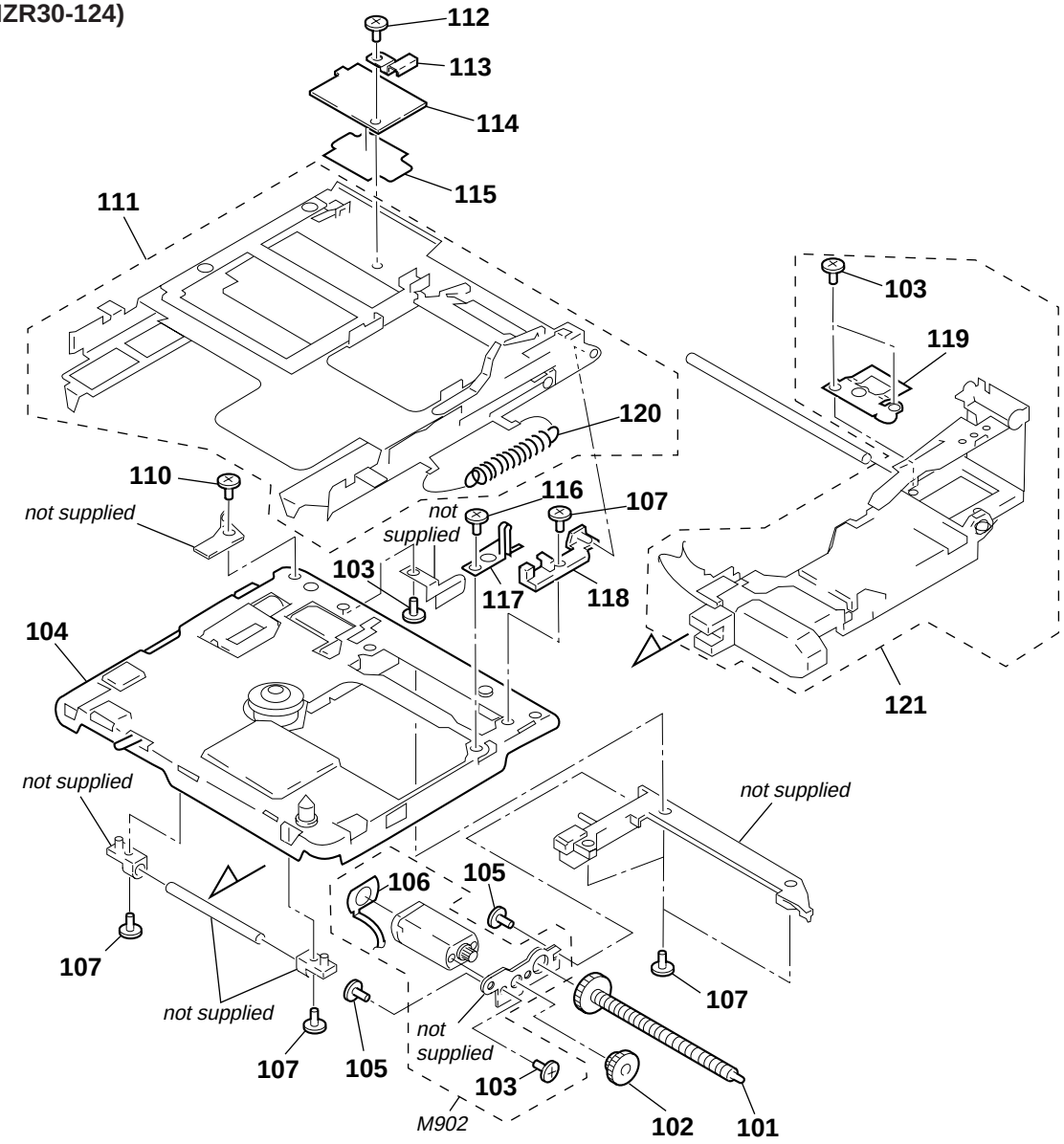
8-2. CHASSIS SECTION



Ref. No.	Part No.	Description	Remark
51	1-473-895-11	SWITCH UNIT (WITH JOG DIAL)	
52	4-984-017-11	SCREW (1.7X2.5), TAPPING	
53	4-986-186-01	RETAINER (DIAL)	
54	4-963-924-01	SCREW (DAMPER)	
55	X-4947-771-1	BELT ASSY, ORNAMENTAL	
56	4-983-998-01	KNOB (REC)	
57	4-984-006-01	SCREW, STEP	
58	4-983-995-01	LEVER (REC)	
59	4-984-004-01	SPRING (LOCK), COMPRESSION	
60	4-983-993-01	LEVER (OPEN)	
61	4-983-994-01	ARM, LOCK	
62	4-963-883-21	SCREW (M1.4), PRECISION PAN···(SILVER)	
62	4-963-883-31	SCREW (M1.4), PRECISION PAN···(BLUE)	
63	X-4947-717-1	PLATE ASSY, FULCRUM	
64	4-983-311-01	DAMPER	

Ref. No.	Part No.	Description	Remark
65	4-986-188-01	REINFORCEMENT	
66	3-335-797-91	SCREW (M1.4), TOOTHED LOCK	
67	A-3306-147-A	SWITCH BOARD, COMPLETE	
68	A-3293-253-A	POWER BOARD, COMPLETE	
69	4-986-183-01	LID, BATTERY CASE	
70	X-4947-720-1	PLATE (BATTERY)ASSY,ORNAMENTAL ···(SILVER)	
70	X-4947-842-1	PLATE (BATTERY)ASSY, (L)···(BLUE)	
71	X-4947-772-1	CASE ASSY, BATTERY	
72	4-984-016-01	SPRING (POP UP), COIL	
73	4-988-114-01	TERMINAL, BATTERY	
74	1-777-761-11	WIRE (FLAT TYPE) (24 CORE)	
75	4-984-019-01	SHAFT (BATTERY CASE LID)	
76	4-984-018-01	PLATE, FULCRUM	

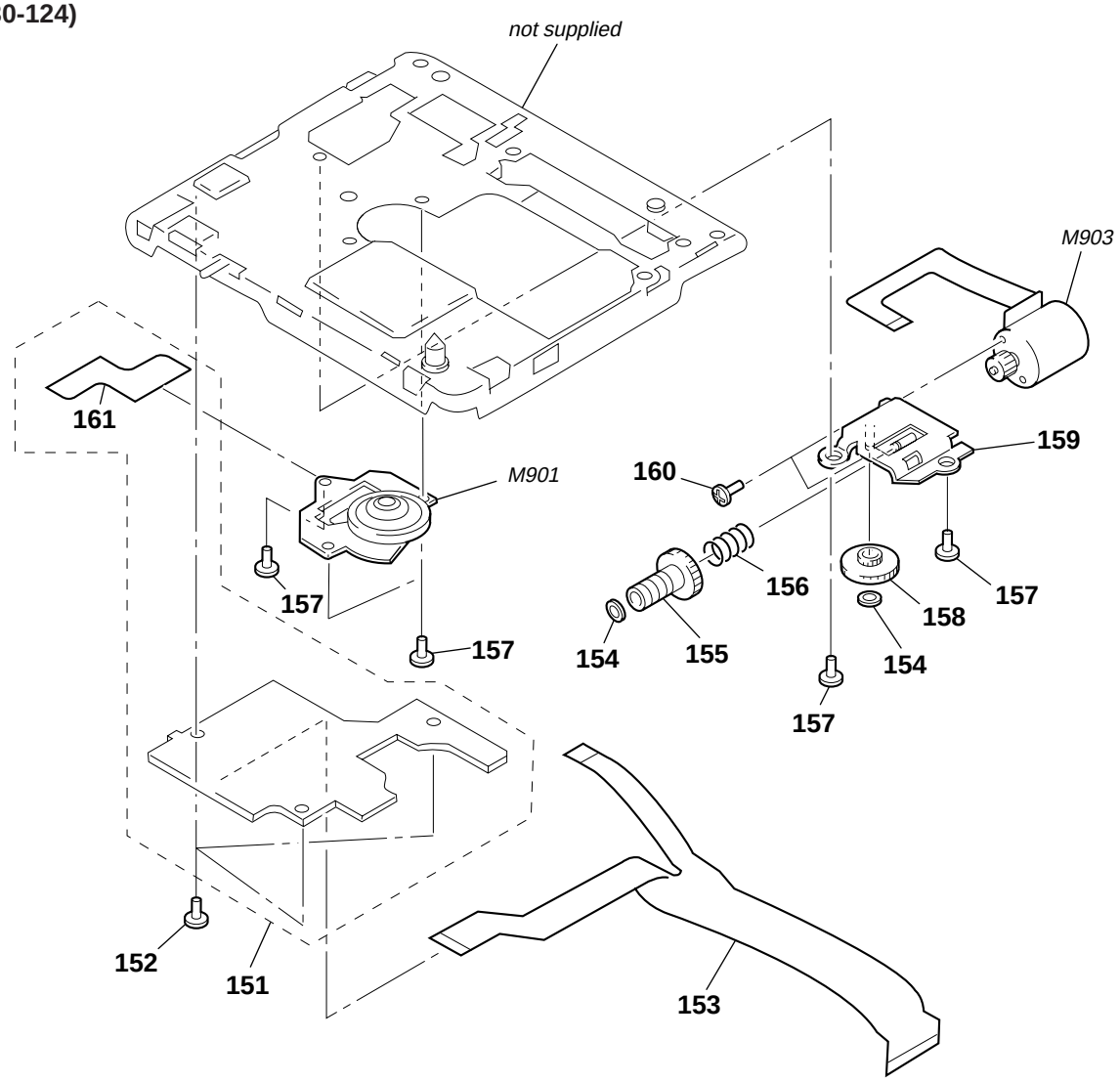
8-3. MECHANISM DECK SECTION-1
(MT-MZR30-124)



The components identified by mark ⚠ or dotted line with mark ⚠ are critical for safety. Replace only with part number specified.	Les composants identifiés par une marque ⚠sont critiques pour la sécurité. Ne les remplacer que par une pièce portant le numéro spécifié.

Ref. No.	Part No.	Description	Remark
101	A-3303-501-A	SCREW BLOCK ASSY, LEAD	
102	4-972-548-01	GEAR (BH)	
103	3-366-890-11	SCREW (M1.4)	
104	X-4947-429-1	CHASSIS ASSY	
105	4-964-537-01	SCREW (M1.4X4.5), TAPPING	
106	1-651-018-11	SLED FLEXIBLE BOARD	
107	3-704-197-33	SCREW (M1.4X3.0), LOCKING	
110	4-964-538-01	SCREW (M1.4X2)	
111	X-4947-887-1	HOLDER ASSY	
112	4-955-841-01	SCREW	
113	4-988-174-01	STOPPER, LEVER	
* 114	1-663-390-11	REC BOARD	
115	4-984-032-01	SHEET, INSULATING	
116	3-348-160-01	SCREW (M1.4X1.3),PRECISION PAN	
117	4-983-357-01	CLAW, LOCK RELEASE	
* 118	4-983-356-01	GUIDE, HOLDER	
119	4-963-914-02	RACK (INSERTER)	
120	4-983-358-01	SPRING, TENSION	
⚠121	X-4948-260-1	OPTICAL PICK-UP ASSY	
M902	A-3303-502-A	MOTOR BLOCK ASSY (SLED)	

8-4. MECHANISM DECK SECTION-2
(MT-MZR30-124)



Ref. No.	Part No.	Description	Remark
151	A-3293-256-A	CONTROL PC BOARD ASSY,	
152	3-366-890-11	SCREW (M1.4)	
153	1-663-392-11	MD FLEXIBLE BOARD	
154	3-338-645-31	WASHER (0.8-2.5)	
155	4-963-901-01	GEAR, WORM	
156	4-972-546-01	SPRING (WORM GEAR),COMPRESSION	
157	4-955-841-01	SCREW	
158	4-963-898-01	GEAR (WORM WHEEL)	
159	X-4944-449-1	CHASSIS ASSY, GEAR	
160	4-964-564-01	SCREW (M1.2X1.6)	
161	1-651-017-11	CLV FLEXIBLE BOARD	
M901	1-698-542-11	MOTOR (SPINDLE)	
M903	A-3303-499-A	STEPPER BLOCK ASSY (STEPPING)	

SECTION 9
ELECTRICAL PARTS LIST

CONTROL **MAIN**

NOTE :
- Due to standardization, replacements in the parts list may be different from the parts specified in the diagrams or the components used on the set.
- -XX, -X mean standardized parts, so they may have some difference from the original one.
- RESISTORS
  All resistors are in ohms
  METAL : Metal-film resistor
  METAL OXIDE :Metal oxide-film resistor
  F : nonflammable
- Items marked " * "are not stocked since they are seldom required for routine service. Some delay should be anticipated when ordering these items.
- SEMICONDUCTORS
  In each case, u : µ , for example :
  uA.... : µ A.... , uPA.... : µ PA....
  uPB.... : µ PB.... , uPC.... : µ PC....
  uPD.... : µ PD....
- CAPACITORS
  uF : µ F
- COILS
  uH : µ H
- Abbreviation
  CND : Canadian
  AUS : Australian
  E13 : 220-230V AC area
  E33 : 100-240V AC area

The components identified by mark ⚠ or dotted line with mark ⚠ are critical for safety.
Replace only with part number specified.

Les composants identifiés par une marque ⚠sont critiques pour la sécurité.
Ne les remplacer que par une pièce portant le numéro spécifié.

When indicating parts by reference number, please include the board.

Ref. No.	Part No.	Description			Remark
	A-3293-256-A	CONTROL BOARD, COMPLETE			
		**********			
	1-651-017-11	CLV FLEXIBLE BOARD			
		< CAPACITOR >			
C701	1-164-227-11	CERAMIC CHIP	0.022uF	10%	25V
C702	1-165-176-11	CERAMIC CHIP	0.047uF	10%	16V
C703	1-164-227-11	CERAMIC CHIP	0.022uF	10%	25V
C704	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C705	1-162-967-11	CERAMIC CHIP	0.0033uF	10%	50V
C706	1-162-967-11	CERAMIC CHIP	0.0033uF	10%	50V
C707	1-162-967-11	CERAMIC CHIP	0.0033uF	10%	50V
C709	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C710	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C711	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
		< CONNECTOR >			
CN701	1-691-356-21	CONNECTOR, FFC/FPC (ZIF) 18P			
CN702	1-691-370-11	CONNECTOR, FFC/FPC 6P			
		< IC >			
IC701	8-759-335-44	IC CXA8048N			
		< TRANSISTOR >			
Q703	8-729-427-83	TRANSISTOR XP6501			
		< RESISTOR >			
R701	1-218-871-11	METAL CHIP	10K	0.50%	1/16W
R702	1-218-871-11	METAL CHIP	10K	0.50%	1/16W
R703	1-216-815-11	METAL CHIP	330	5%	1/16W
R704	1-217-671-11	METAL CHIP	1	5%	1/10W
R705	1-217-671-11	METAL CHIP	1	5%	1/10W
R706	1-216-833-11	METAL CHIP	10K	5%	1/16W
R711	1-216-864-11	METAL CHIP	0	5%	1/16W

Ref. No.	Part No.	Description			Remark
		< SWITCH >			
S701	1-692-849-21	SWITCH, PUSH (1 KEY) (MEDIR)			
S702	1-692-847-21	SWITCH, PUSH (1 KEY) (PROTECT)			
S703	1-692-377-31	SWITCH, PUSH (1 KEY) (REFLECT)			
S704	1-572-467-41	SWITCH, PUSH (1 KEY) (INITIAL)			
S705	1-572-467-41	SWITCH, PUSH (1 KEY) (INLIMIT)			
**********					
	A-3293-312-A	MAIN BOARD, COMPLETE (E, Tourist)			
	A-3293-360-A	MAIN BOARD, COMPLETE (AEP, UK, AUS)			
	A-3293-361-A	MAIN BOARD, COMPLETE (US, CND)			
		**********			
		< CAPACITOR >			
C101	1-162-966-11	CERAMIC CHIP	0.0022uF	10%	50V
C102	1-162-927-11	CERAMIC CHIP	100PF	5%	50V
C103	1-135-337-11	TANTAL. CHIP	1uF	20%	6.3V
C104	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C105	1-164-217-11	CERAMIC CHIP	150PF	5%	50V
C106	1-110-975-11	TANTAL. CHIP	47uF	20%	6.3V
C107	1-107-813-11	TANTAL. CHIP	10uF	20%	6.3V
C108	1-107-812-11	TANTAL. CHIP	4.7uF	20%	6.3V
C109	1-107-813-11	TANTAL. CHIP	10uF	20%	6.3V
C110	1-135-337-11	TANTAL. CHIP	1uF	20%	6.3V
C117	1-135-181-21	TANTALUM CHIP	4.7uF	20%	6.3V
C118	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C120	1-107-823-11	CERAMIC CHIP	0.47uF	10%	16V
C121	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C122	1-162-960-11	CERAMIC CHIP	220PF	10%	50V
C123	1-107-813-11	TANTAL. CHIP	10uF	20%	6.3V
C124	1-165-128-11	CERAMIC CHIP	0.22uF		16V
C125	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C131	1-107-812-11	TANTAL. CHIP	4.7uF	20%	6.3V
C140	1-107-813-11	TANTAL. CHIP	10uF	20%	6.3V
C161	1-162-963-11	CERAMIC CHIP	680PF	10%	50V
C168	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C201	1-162-966-11	CERAMIC CHIP	0.0022uF	10%	50V

MAIN

Ref. No.	Part No.	Description			Remark
C202	1-162-927-11	CERAMIC CHIP	100PF	5%	50V
C203	1-135-337-11	TANTAL. CHIP	1uF	20%	6.3V
C204	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C205	1-164-217-11	CERAMIC CHIP	150PF	5%	50V
C206	1-110-975-11	TANTAL. CHIP	47uF	20%	6.3V
C207	1-107-813-11	TANTAL. CHIP	10uF	20%	6.3V
C208	1-107-812-11	TANTAL. CHIP	4.7uF	20%	6.3V
C209	1-107-813-11	TANTAL. CHIP	10uF	20%	6.3V
C210	1-135-337-11	TANTAL. CHIP	1uF	20%	6.3V
C217	1-135-181-21	TANTALUM CHIP	4.7uF	20%	6.3V
C218	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C220	1-107-823-11	CERAMIC CHIP	0.47uF	10%	16V
C221	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C222	1-162-960-11	CERAMIC CHIP	220PF	10%	50V
C223	1-107-813-11	TANTAL. CHIP	10uF	20%	6.3V
C224	1-165-128-11	CERAMIC CHIP	0.22uF		16V
C225	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C231	1-107-812-11	TANTAL. CHIP	4.7uF	20%	6.3V
C240	1-107-813-11	TANTAL. CHIP	10uF	20%	6.3V
C261	1-162-963-11	CERAMIC CHIP	680PF	10%	50V
C268	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C292	1-107-812-11	TANTAL. CHIP	4.7uF	20%	6.3V
C293	1-104-912-11	TANTALUM CHIP	3.3uF	20%	6.3V
C294	1-104-847-11	TANTAL. CHIP	22uF	20%	4V
C295	1-135-181-21	TANTALUM CHIP	4.7uF	20%	6.3V
C296	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C301	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C302	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C303	1-107-813-11	TANTAL. CHIP	10uF	20%	6.3V
C304	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C305	1-110-975-11	TANTAL. CHIP	47uF	20%	6.3V
C307	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C308	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C310	1-164-361-11	CERAMIC CHIP	0.047uF		16V
C311	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C312	1-110-975-11	TANTAL. CHIP	47uF	20%	6.3V
C314	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C315	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C318	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C319	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C320	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C321	1-104-929-11	TANTAL. CHIP	22uF	20%	6.3V
C322	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C327	1-104-929-11	TANTAL. CHIP	22uF	20%	6.3V
C338	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C345	1-104-929-11	TANTAL. CHIP	22uF	20%	6.3V
C346	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C351	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C359	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C365	1-107-813-11	TANTAL. CHIP	10uF	20%	6.3V
C366	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C367	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V (US,CND)
C368	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C369	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C391	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V (US,CND)
C392	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C393	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V (US,CND)
C394	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V (US,CND)
C399	1-107-816-11	TANTAL. CHIP	0.68uF	20%	10V
C501	1-115-169-11	TANTALUM	10uF	20%	6.3V
C504	1-107-813-11	TANTAL. CHIP	10uF	20%	6.3V
C505	1-107-813-11	TANTAL. CHIP	10uF	20%	6.3V
C506	1-162-965-11	CERAMIC CHIP	0.0015uF	10%	50V
C507	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C508	1-162-969-11	CERAMIC CHIP	0.0068uF	10%	25V
C509	1-115-467-11	CERAMIC CHIP	0.22uF	10%	10V
C510	1-162-968-11	CERAMIC CHIP	0.0047uF	10%	50V
C511	1-162-966-11	CERAMIC CHIP	0.0022uF	10%	50V
C512	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C513	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C515	1-104-752-11	TANTAL. CHIP	33uF	20%	6.3V
C517	1-164-489-11	CERAMIC CHIP	0.22uF	10%	16V
C518	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C519	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C521	1-164-677-11	CERAMIC CHIP	0.033uF	10%	16V
C522	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C523	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C524	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C525	1-104-929-11	TANTAL. CHIP	22uF	20%	6.3V
C526	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C528	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C529	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C530	1-107-823-11	CERAMIC CHIP	0.47uF	10%	16V
C531	1-162-927-11	CERAMIC CHIP	100PF	5%	50V
C532	1-162-967-11	CERAMIC CHIP	0.0033uF	10%	50V
C533	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C534	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C536	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C537	1-107-811-11	TANTAL. CHIP	47uF	20%	4V
C538	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C541	1-162-913-11	CERAMIC CHIP	8PF	0.5PF	50V
C542	1-162-913-11	CERAMIC CHIP	8PF	0.5PF	50V
C544	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C545	1-110-574-11	TANTAL. CHIP	22uF	20%	16V
C547	1-107-765-11	TANTAL. CHIP	3.3uF	20%	16V
C548	1-107-765-11	TANTAL. CHIP	3.3uF	20%	16V
C549	1-107-814-11	TANTAL. CHIP	33uF	20%	10V
C550	1-107-814-11	TANTAL. CHIP	33uF	20%	10V
C551	1-107-765-11	TANTAL. CHIP	3.3uF	20%	16V
C552	1-107-765-11	TANTAL. CHIP	3.3uF	20%	16V
C553	1-107-814-11	TANTAL. CHIP	33uF	20%	10V
C554	1-104-813-11	TANTAL. CHIP	10uF	20%	16V

Ref. No.	Part No.	Description			Remark
C555	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C556	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C557	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C558	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C559	1-162-962-11	CERAMIC CHIP	470PF	10%	50V
C560	1-165-176-11	CERAMIC CHIP	0.047uF	10%	16V
C561	1-165-176-11	CERAMIC CHIP	0.047uF	10%	16V
C562	1-110-574-11	TANTAL. CHIP	22uF	20%	16V
C563	1-135-091-00	TANTALUM CHIP	1uF	20%	16V
C564	1-162-967-11	CERAMIC CHIP	0.0033uF	10%	50V
C565	1-135-180-21	TANTALUM CHIP	3.3uF	20%	10V
C566	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C567	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C568	1-135-337-11	TANTAL. CHIP	1uF	20%	6.3V
C569	1-164-227-11	CERAMIC CHIP	0.022uF	10%	25V
C570	1-107-814-11	TANTAL. CHIP	33uF	20%	10V
C571	1-104-630-11	TANTAL. CHIP	33uF	20%	6.3V
C572	1-107-682-11	CERAMIC CHIP	1uF	10%	16V
C574	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C575	1-164-217-11	CERAMIC CHIP	150PF	5%	50V
C576	1-164-217-11	CERAMIC CHIP	150PF	5%	50V
C577	1-164-217-11	CERAMIC CHIP	150PF	5%	50V
C578	1-107-823-11	CERAMIC CHIP	0.47uF	10%	16V
C714	1-107-813-11	TANTAL. CHIP	10uF	20%	6.3V
C715	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C716	1-107-813-11	TANTAL. CHIP	10uF	20%	6.3V
C811	1-164-677-11	CERAMIC CHIP	0.033uF	10%	16V
C812	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C813	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C814	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C815	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C816	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C817	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C818	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C819	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C820	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C821	1-164-315-11	CERAMIC CHIP	470PF	5%	50V
C822	1-164-315-11	CERAMIC CHIP	470PF	5%	50V
C824	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C825	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C826	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C827	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C828	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C829	1-135-337-11	TANTAL. CHIP	1uF	20%	6.3V
C830	1-110-569-11	TANTAL. CHIP	47uF	20%	6.3V
C831	1-110-574-11	TANTAL. CHIP	22uF	20%	16V
C833	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C834	1-164-315-11	CERAMIC CHIP	470PF	5%	50V
C835	1-164-315-11	CERAMIC CHIP	470PF	5%	50V
C836	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C851	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C861	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C862	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C901	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C904	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C905	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C908	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C910	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C913	1-104-913-11	TANTAL. CHIP	10uF	20%	16V
C914	1-135-213-21	TANTAL. CHIP	3.3uF	20%	25V
C3002	1-135-181-21	TANTALUM CHIP	4.7uF	20%	6.3V
		< CONNECTOR >			
CN501	1-691-386-11	CONNECTOR, FFC/FPC 22P			
CN502	1-691-360-11	CONNECTOR, FFC/FPC (ZIF) 22P			
CN903	1-691-362-11	CONNECTOR, FFC/FPC (ZIF) 24P			
CN904	1-691-347-11	CONNECTOR, FFC/FPC (ZIF) 9P			
CN905	1-691-351-11	CONNECTOR, FFC/FPC (ZIF) 13P			
		< DIODE >			
D101	8-719-017-58	DIODE MA8068			
D201	8-719-017-58	DIODE MA8068			
D301	8-719-017-58	DIODE MA8068			
D303	8-719-017-58	DIODE MA8068			
D304	8-719-017-58	DIODE MA8068			
D305	8-719-017-58	DIODE MA8068			
D307	8-719-017-58	DIODE MA8068			
D308	8-719-421-27	DIODE MA728			
D310	8-719-017-58	DIODE MA8068			
D501	8-719-421-27	DIODE MA728			
D502	8-719-421-27	DIODE MA728			
D503	8-719-049-09	DIODE 1SS367-T3SONY			
D504	8-719-049-09	DIODE 1SS367-T3SONY			
D803	8-719-052-72	LED CL-220HR-C (REC)			
D804	8-719-421-27	DIODE MA728			
D805	8-719-421-27	DIODE MA728			
D806	8-719-421-27	DIODE MA728			
D807	8-719-421-27	DIODE MA728			
D808	8-719-047-73	DIODE HRU0302A-TR			
D809	8-719-421-27	DIODE MA728			
D902	8-719-404-49	DIODE MA111			
D903	8-719-977-03	DIODE DTZ5.6B			
D905	8-719-975-33	DIODE RB110C			
D906	8-719-421-27	DIODE MA728			
D907	8-719-975-33	DIODE RB110C			
D3001	8-719-421-27	DIODE MA728			
		< FERRITE BEAD >			
FB309	1-256-864-11	METAL CHIP	0	5%	1/16W (EXCEPT US, CND)
FB309	1-414-385-11	INDUCTOR, FERRITE BEAD (US, CND)			
FB350	1-414-228-11	INDUCTOR, FERRITE BEAD			
FB501	1-414-385-11	INDUCTOR, FERRITE BEAD			

MAIN

Ref. No.	Part No.	Description	Remark
FB502	1-216-864-11	METAL CHIP 0 5% 1/16W	(E, Tourist)
FB502	1-414-385-11	INDUCTOR, FERRITE BEAD (EXCEPT E, Tourist)	
FB503	1-216-864-11	METAL CHIP 0 5% 1/16W	(EXCEPT US, CND)
FB503	1-414-385-11	INDUCTOR, FERRITE BEAD (US, CND)	
FB504	1-216-864-11	METAL CHIP 0 5% 1/16W	(EXCEPT US, CND)
FB504	1-414-385-11	INDUCTOR, FERRITE BEAD (US, CND)	
FB505	1-216-864-11	METAL CHIP 0 5% 1/16W	(EXCEPT US, CND)
FB505	1-414-385-11	INDUCTOR, FERRITE BEAD (US, CND)	
		< IC >	
IC301	8-759-337-18	IC TK11225AMTL	
IC302	8-759-252-90	IC TLV2362IPW-ELM1500	
IC303	8-759-439-74	IC AK4515-VQ	
IC304	8-759-252-90	IC TLV2362IPW-ELM1500	
IC306	8-759-173-00	IC XC61AN1102MR	
IC352	8-759-332-22	IC DS1802E-TE2	
IC501	8-752-074-77	IC CXA2523R	
IC502	8-759-234-20	IC TC7S08F-TE85L	
IC503	8-752-384-46	IC CXD2652R	
IC504	8-759-432-73	IC XC62SPR212MR	
IC505	8-759-442-80	IC MPC17A38ZVMEL	
IC506	8-759-329-43	IC MPC18A20VMEL	
IC508	8-759-710-79	IC NJM2107F-TE1	
IC509	8-759-341-28	IC HM51W4400BTT-7	
IC510	8-759-333-42	IC XC61AN3002MR	
IC702	8-759-329-45	IC MPC17A33SVMEL	
IC801	8-752-878-84	IC CXP81960M-632R	
IC802	8-759-343-90	IC RS5RJ29261-T1	
IC803	8-759-332-25	IC XC31PNS01AMR	
IC804	8-759-343-88	IC DS1302Z-TE2	
IC805	8-759-458-97	IC LA4800V-TLM	
IC807	8-759-425-16	IC AK93C45LV-L	
IC909	8-759-427-91	IC MM1332DFBE	
		< JACK >	
J301	1-764-460-11	JACK (MIC,PLUG IN POWER)	
J302	1-778-368-11	JACK, HEADPHONE (7REMOTE)	
J303	1-764-460-21	JACK (LINE OUT)	
J304	8-759-252-45	IC GP1F365R (LINE IN,OPTICAL)	
J901	1-568-907-11	JACK,DC(POLARITY UNIFIED TYPE) (DC IN 6V)	
		< COIL >	
L303	1-414-398-11	INDUCTOR 10uH	
L304	1-414-410-21	INDUCTOR 10uH	
L501	1-414-398-11	INDUCTOR 10uH	
L502	1-414-398-11	INDUCTOR 10uH	
L504	1-414-410-21	INDUCTOR 10uH	
L505	1-412-034-11	INDUCTOR CHIP 330uH	
L506	1-414-402-11	INDUCTOR 47uH	
L507	1-414-402-11	INDUCTOR 47uH	
L508	1-414-402-11	INDUCTOR 47uH	
L509	1-414-402-11	INDUCTOR 47uH	
L510	1-414-410-21	INDUCTOR 10uH	
L511	1-414-402-11	INDUCTOR 47uH	
L512	1-411-322-21	COIL, CHOKE 68.0uH	
L513	1-414-398-11	INDUCTOR 10uH	
L514	1-412-034-11	INDUCTOR CHIP 330uH	
L801	1-414-402-11	INDUCTOR 47uH	
		< LINE FILTER >	
LF901	1-411-312-11	FILTER, COMMON MODE	
		< TRANSISTOR >	
Q101	8-729-013-37	TRANSISTOR 2SC4213-AB-TE85L	
Q102	8-729-013-37	TRANSISTOR 2SC4213-AB-TE85L	
Q201	8-729-013-37	TRANSISTOR 2SC4213-AB-TE85L	
Q202	8-729-013-37	TRANSISTOR 2SC4213-AB-TE85L	
Q301	8-729-029-14	TRANSISTOR DTC144EUA-T106	
Q302	8-729-028-91	TRANSISTOR DTA144EUA-T106	
Q305	8-729-023-89	TRANSISTOR 2SJ305(TE85L)	
Q309	8-729-028-91	TRANSISTOR DTA144EUA-T106	
Q311	8-729-028-91	TRANSISTOR DTA144EUA-T106	
Q312	8-729-230-60	TRANSISTOR 2SA1586-YG	
Q313	8-729-929-99	TRANSISTOR UMB11-TN	
Q314	8-729-929-99	TRANSISTOR UMB11-TN	
Q318	8-729-029-14	TRANSISTOR DTC144EUA-T106	
Q320	8-729-029-14	TRANSISTOR DTC144EUA-T106	
Q502	8-729-422-39	TRANSISTOR XN4404	
Q503	8-729-930-13	TRANSISTOR UMH2	
Q504	8-729-019-25	TRANSISTOR 2SK1467-TD	
Q505	8-729-029-14	TRANSISTOR DTC144EUA-T106	
Q506	8-729-023-89	TRANSISTOR 2SJ305(TE85L)	
Q701	8-729-028-91	TRANSISTOR DTA144EUA-T106	
Q702	8-729-904-07	TRANSISTOR FMG2	
Q801	8-729-028-91	TRANSISTOR DTA144EUA-T106	
Q806	8-729-031-34	TRANSISTOR 2SK2034	
Q810	8-729-013-37	TRANSISTOR 2SC4213-AB-TE85L	
Q811	8-729-013-37	TRANSISTOR 2SC4213-AB-TE85L	
Q812	8-729-013-37	TRANSISTOR 2SC4213-AB-TE85L	
Q901	8-729-907-00	TRANSISTOR DTC114EU	
Q902	8-729-120-53	TRANSISTOR 2SJ132-Z	
Q903	8-729-029-14	TRANSISTOR DTC144EUA-T106	
Q904	8-729-921-93	TRANSISTOR 2SB1182F5-QR	
Q907	8-729-028-99	TRANSISTOR DTC114YUA-T106	
Q910	8-729-013-37	TRANSISTOR 2SC4213-AB-TE85L	
		< RESISTOR >	
R101	1-218-867-11	METAL CHIP 6.8K 0.50% 1/16W	
R102	1-218-887-11	METAL CHIP 47K 0.50% 1/16W	
R103	1-218-867-11	METAL CHIP 6.8K 0.50% 1/16W	
R104	1-218-887-11	METAL CHIP 47K 0.50% 1/16W	

Ref. No.	Part No.	Description			Remark
R105	1-216-837-11	METAL CHIP	22K	5%	1/16W
R107	1-218-883-11	METAL CHIP	33K	0.50%	1/16W
R108	1-218-843-11	METAL CHIP	680	0.50%	1/16W
R111	1-218-891-11	METAL CHIP	68K	0.50%	1/16W
R112	1-218-887-11	METAL CHIP	47K	0.50%	1/16W
R119	1-216-789-11	METAL CHIP	2.2	5%	1/16W
R121	1-218-891-11	METAL CHIP	68K	0.50%	1/16W
R122	1-218-875-11	METAL CHIP	15K	0.50%	1/16W
R123	1-218-855-11	METAL CHIP	2.2K	0.50%	1/16W
R124	1-218-875-11	METAL CHIP	15K	0.50%	1/16W
R134	1-218-847-11	METAL CHIP	1K	0.50%	1/16W
R136	1-218-871-11	METAL CHIP	10K	0.50%	1/16W
R137	1-216-827-11	METAL CHIP	3.3K	5%	1/16W
R139	1-216-813-11	METAL CHIP	220	5%	1/16W
R140	1-216-813-11	METAL CHIP	220	5%	1/16W
R141	1-216-833-11	METAL CHIP	10K	5%	1/16W
R144	1-216-864-11	METAL CHIP	0	5%	1/16W
					(EXCEPT US, CND)
R144	1-414-385-11	INDUCTOR, FERRITE BEAD (US, CND)			
R145	1-218-879-11	METAL CHIP	22K	0.50%	1/16W
R146	1-218-879-11	METAL CHIP	22K	0.50%	1/16W
R159	1-216-864-11	METAL CHIP	0	5%	1/16W
					(EXCEPT US, CND)
R159	1-414-385-11	INDUCTOR, FERRITE BEAD (US, CND)			
R160	1-216-857-11	METAL CHIP	1M	5%	1/16W
R201	1-218-867-11	METAL CHIP	6.8K	0.50%	1/16W
R202	1-218-887-11	METAL CHIP	47K	0.50%	1/16W
R203	1-218-867-11	METAL CHIP	6.8K	0.50%	1/16W
R204	1-218-887-11	METAL CHIP	47K	0.50%	1/16W
R205	1-216-837-11	METAL CHIP	22K	5%	1/16W
R207	1-218-883-11	METAL CHIP	33K	0.50%	1/16W
R208	1-218-843-11	METAL CHIP	680	0.50%	1/16W
R211	1-218-891-11	METAL CHIP	68K	0.50%	1/16W
R212	1-218-887-11	METAL CHIP	47K	0.50%	1/16W
R219	1-216-789-11	METAL CHIP	2.2	5%	1/16W
R221	1-218-891-11	METAL CHIP	68K	0.50%	1/16W
R222	1-218-875-11	METAL CHIP	15K	0.50%	1/16W
R223	1-218-855-11	METAL CHIP	2.2K	0.50%	1/16W
R224	1-218-875-11	METAL CHIP	15K	0.50%	1/16W
R234	1-218-847-11	METAL CHIP	1K	0.50%	1/16W
R236	1-218-871-11	METAL CHIP	10K	0.50%	1/16W
R237	1-216-827-11	METAL CHIP	3.3K	5%	1/16W
R239	1-216-813-11	METAL CHIP	220	5%	1/16W
R240	1-216-813-11	METAL CHIP	220	5%	1/16W
R241	1-216-833-11	METAL CHIP	10K	5%	1/16W
R244	1-216-864-11	METAL CHIP	0	5%	1/16W
					(EXCEPT US, CND)
R244	1-414-385-11	INDUCTOR, FERRITE BEAD (US, CND)			
R245	1-218-879-11	METAL CHIP	22K	0.50%	1/16W
R246	1-218-879-11	METAL CHIP	22K	0.50%	1/16W
R259	1-216-864-11	METAL CHIP	0	5%	1/16W
					(EXCEPT US, CND)

Ref. No.	Part No.	Description			Remark
R259	1-414-385-11	INDUCTOR, FERRITE BEAD (US, CND)			
R260	1-216-857-11	METAL CHIP	1M	5%	1/16W
R301	1-216-833-11	METAL CHIP	10K	5%	1/16W
R302	1-216-833-11	METAL CHIP	10K	5%	1/16W
R303	1-216-857-11	METAL CHIP	1M	5%	1/16W
R306	1-216-150-91	METAL GLAZE	10	5%	1/8W
R307	1-216-809-11	METAL CHIP	100	5%	1/16W
R308	1-216-809-11	METAL CHIP	100	5%	1/16W
R309	1-216-809-11	METAL CHIP	100	5%	1/16W
R346	1-216-857-11	METAL CHIP	1M	5%	1/16W
R347	1-216-857-11	METAL CHIP	1M	5%	1/16W
R352	1-216-864-11	METAL CHIP	0	5%	1/16W
					(EXCEPT US, CND)
R352	1-414-385-11	INDUCTOR, FERRITE BEAD (US, CND)			
R355	1-216-847-11	METAL CHIP	150K	5%	1/16W
R359	1-216-864-11	METAL CHIP	0	5%	1/16W
					(EXCEPT US, CND)
R359	1-414-385-11	INDUCTOR, FERRITE BEAD (US, CND)			
R361	1-216-829-11	METAL CHIP	4.7K	5%	1/16W
R364	1-216-789-11	METAL CHIP	2.2	5%	1/16W
R365	1-216-809-11	METAL CHIP	100	5%	1/16W
R367	1-216-829-11	METAL CHIP	4.7K	5%	1/16W
R368	1-216-829-11	METAL CHIP	4.7K	5%	1/16W
R374	1-216-845-11	METAL CHIP	100K	5%	1/16W
R380	1-216-864-11	METAL CHIP	0	5%	1/16W
R381	1-216-809-11	METAL CHIP	100	5%	1/16W
R398	1-216-839-11	METAL CHIP	33K	5%	1/16W
R399	1-216-839-11	METAL CHIP	33K	5%	1/16W
R501	1-216-835-11	METAL CHIP	15K	5%	1/16W
R502	1-216-835-11	METAL CHIP	15K	5%	1/16W
R503	1-216-831-11	METAL CHIP	6.8K	5%	1/16W
R504	1-216-859-11	METAL GLAZE	1.5M	5%	1/16W
R505	1-216-789-11	METAL CHIP	2.2	5%	1/16W
R506	1-216-811-11	METAL CHIP	150	5%	1/16W
R507	1-216-833-11	METAL CHIP	10K	5%	1/16W
R508	1-216-817-11	METAL CHIP	470	5%	1/16W
R509	1-216-853-11	METAL CHIP	470K	5%	1/16W
R510	1-216-825-11	METAL CHIP	2.2K	5%	1/16W
R511	1-216-825-11	METAL CHIP	2.2K	5%	1/16W
R512	1-216-825-11	METAL CHIP	2.2K	5%	1/16W
R513	1-216-843-11	METAL CHIP	68K	5%	1/16W
R514	1-216-864-11	METAL CHIP	0	5%	1/16W
R515	1-216-864-11	METAL CHIP	0	5%	1/16W
R516	1-216-821-11	METAL CHIP	1K	5%	1/16W
R517	1-216-162-00	METAL GLAZE	33	5%	1/8W
R519	1-216-825-11	METAL CHIP	2.2K	5%	1/16W
R520	1-216-841-11	METAL CHIP	47K	5%	1/16W
R524	1-216-833-11	METAL CHIP	10K	5%	1/16W
R525	1-216-845-11	METAL CHIP	100K	5%	1/16W
R526	1-216-853-11	METAL CHIP	470K	5%	1/16W
R527	1-216-825-11	METAL CHIP	2.2K	5%	1/16W
R528	1-216-821-11	METAL CHIP	1K	5%	1/16W

MAIN

Ref. No.	Part No.	Description			Remark
R529	1-216-821-11	METAL CHIP	1K	5%	1/16W
R530	1-216-827-11	METAL CHIP	3.3K	5%	1/16W
R531	1-216-845-11	METAL CHIP	100K	5%	1/16W
R532	1-216-833-11	METAL CHIP	10K	5%	1/16W
R533	1-216-839-11	METAL CHIP	33K	5%	1/16W
R534	1-216-839-11	METAL CHIP	33K	5%	1/16W
R535	1-216-843-11	METAL CHIP	68K	5%	1/16W
R536	1-218-891-11	METAL CHIP	68K	0.50%	1/16W
R537	1-218-899-11	METAL CHIP	150K	0.50%	1/16W
R538	1-218-895-11	METAL CHIP	100K	0.50%	1/16W
R539	1-216-833-11	METAL CHIP	10K	5%	1/16W
R540	1-216-857-11	METAL CHIP	1M	5%	1/16W
R541	1-216-843-11	METAL CHIP	68K	5%	1/16W
R542	1-218-887-11	METAL CHIP	47K	0.50%	1/16W
R543	1-218-871-11	METAL CHIP	10K	0.50%	1/16W
R544	1-216-843-11	METAL CHIP	68K	5%	1/16W
R545	1-216-845-11	METAL CHIP	100K	5%	1/16W
R546	1-216-841-11	METAL CHIP	47K	5%	1/16W
R549	1-216-845-11	METAL CHIP	100K	5%	1/16W
R554	1-216-789-11	METAL CHIP	2.2	5%	1/16W
R555	1-216-817-11	METAL CHIP	470	5%	1/16W
R556	1-216-864-11	METAL CHIP	0	5%	1/16W
R559	1-216-811-11	METAL CHIP	150	5%	1/16W
R560	1-216-833-11	METAL CHIP	10K	5%	1/16W
R562	1-218-871-11	METAL CHIP	10K	0.50%	1/16W
R563	1-216-833-11	METAL CHIP	10K	5%	1/16W
R564	1-216-843-11	METAL CHIP	68K	5%	1/16W
R565	1-216-845-11	METAL CHIP	100K	5%	1/16W
R566	1-216-841-11	METAL CHIP	47K	5%	1/16W
R571	1-216-817-11	METAL CHIP	470	5%	1/16W (US, CND)
R571	1-216-864-11	METAL CHIP	0	5%	1/16W (EXCEPT US, CND)
R572	1-216-817-11	METAL CHIP	470	5%	1/16W (US, CND)
R572	1-216-864-11	METAL CHIP	0	5%	1/16W (EXCEPT US, CND)
R576	1-216-813-11	METAL CHIP	220	5%	1/16W (EXCEPT US, CND)
R576	1-216-817-11	METAL CHIP	470	5%	1/16W (US, CND)
R708	1-216-845-11	METAL CHIP	100K	5%	1/16W
R709	1-216-845-11	METAL CHIP	100K	5%	1/16W
R710	1-216-819-11	METAL CHIP	680	5%	1/16W
R802	1-216-851-11	METAL CHIP	330K	5%	1/16W
R803	1-216-857-11	METAL CHIP	1M	5%	1/16W
R806	1-216-857-11	METAL CHIP	1M	5%	1/16W
R807	1-216-857-11	METAL CHIP	1M	5%	1/16W
R813	1-216-809-11	METAL CHIP	100	5%	1/16W
R816	1-216-851-11	METAL CHIP	330K	5%	1/16W
R817	1-216-851-11	METAL CHIP	330K	5%	1/16W
R818	1-216-857-11	METAL CHIP	1M	5%	1/16W
R819	1-218-895-11	METAL CHIP	100K	0.50%	1/16W
R820	1-218-887-11	METAL CHIP	47K	0.50%	1/16W
R821	1-218-887-11	METAL CHIP	47K	0.50%	1/16W
R822	1-218-887-11	METAL CHIP	47K	0.50%	1/16W
R823	1-218-895-11	METAL CHIP	100K	0.50%	1/16W
R826	1-216-864-11	METAL CHIP	0	5%	1/16W
R827	1-216-864-11	METAL CHIP	0	5%	1/16W
R828	1-216-853-11	METAL CHIP	470K	5%	1/16W
R829	1-216-847-11	METAL CHIP	150K	5%	1/16W
R830	1-216-851-11	METAL CHIP	330K	5%	1/16W
R831	1-216-853-11	METAL CHIP	470K	5%	1/16W
R832	1-216-851-11	METAL CHIP	330K	5%	1/16W
R833	1-216-857-11	METAL CHIP	1M	5%	1/16W
R834	1-216-857-11	METAL CHIP	1M	5%	1/16W
R835	1-216-845-11	METAL CHIP	100K	5%	1/16W
R836	1-218-871-11	METAL CHIP	10K	0.50%	1/16W
R837	1-216-851-11	METAL CHIP	330K	5%	1/16W
R838	1-218-887-11	METAL CHIP	47K	0.50%	1/16W
R839	1-218-871-11	METAL CHIP	10K	0.50%	1/16W
R840	1-218-879-11	METAL CHIP	22K	0.50%	1/16W
R841	1-216-863-11	METAL GLAZE	3.3M	5%	1/16W
R847	1-216-845-11	METAL CHIP	100K	5%	1/16W
R852	1-218-883-11	METAL CHIP	33K	0.50%	1/16W
R853	1-216-809-11	METAL CHIP	100	5%	1/16W
R854	1-216-857-11	METAL CHIP	1M	5%	1/16W
R855	1-216-851-11	METAL CHIP	330K	5%	1/16W
R856	1-216-821-11	METAL CHIP	1K	5%	1/16W
R857	1-216-833-11	METAL CHIP	10K	5%	1/16W
R861	1-216-857-11	METAL CHIP	1M	5%	1/16W
R862	1-216-863-11	METAL GLAZE	3.3M	5%	1/16W
R863	1-216-857-11	METAL CHIP	1M	5%	1/16W
R864	1-216-857-11	METAL CHIP	1M	5%	1/16W
R865	1-216-809-11	METAL CHIP	100	5%	1/16W
R866	1-216-851-11	METAL CHIP	330K	5%	1/16W
R867	1-216-829-11	METAL CHIP	4.7K	5%	1/16W
R868	1-216-845-11	METAL CHIP	100K	5%	1/16W
R869	1-216-829-11	METAL CHIP	4.7K	5%	1/16W
R870	1-216-829-11	METAL CHIP	4.7K	5%	1/16W
R871	1-216-829-11	METAL CHIP	4.7K	5%	1/16W
R872	1-216-829-11	METAL CHIP	4.7K	5%	1/16W
R873	1-216-829-11	METAL CHIP	4.7K	5%	1/16W
R874	1-216-829-11	METAL CHIP	4.7K	5%	1/16W
R876	1-216-863-11	METAL GLAZE	3.3M	5%	1/16W
R877	1-216-845-11	METAL CHIP	100K	5%	1/16W
R878	1-216-833-11	METAL CHIP	10K	5%	1/16W
R901	1-216-817-11	METAL CHIP	470	5%	1/16W
R902	1-216-833-11	METAL CHIP	10K	5%	1/16W
R905	1-216-863-11	METAL GLAZE	3.3M	5%	1/16W
R910	1-216-853-11	METAL CHIP	470K	5%	1/16W
R911	1-216-845-11	METAL CHIP	100K	5%	1/16W
R970	1-216-853-11	METAL CHIP	470K	5%	1/16W
R972	1-208-293-11	METAL GLAZE	0.47	10%	1/10W

Ref. No.	Part No.	Description			Remark
R975	1-208-293-11	METAL GLAZE	0.47	10%	1/10W
R3001	1-216-837-11	METAL CHIP	22K	5%	1/16W
		< COMPOSITION CIRCUIT BLOCK >			
RB535	1-239-436-11	NETWORK RESISTOR (CHIP) 33K			
RB801	1-233-703-21	NETWORK RESISTOR (CHIP) 1M			
RB802	1-239-446-11	NETWORK RESISTOR (CHIP) 330K			
		< SWITCH >			
S301	1-762-078-11	SWITCH, SLIDE (MIC SENS)			
S808	1-572-467-41	SWITCH, PUSH (1 KEY) (◢REC)			
S809	1-572-473-11	SWITCH, TACTIL (CLOCK SET)			
S810	1-572-499-21	SWITCH, TACTIL (DIGITAL MEGA BASS)			
S811	1-762-078-11	SWITCH, SLIDE (AVLS)			
S816	1-762-078-11	SWITCH, SLIDE (SYNCHRO REC)			
S817	1-762-805-21	SWITCH, PUSH (DOOR OPEN/CLOSE)			
S818	1-762-078-11	SWITCH, SLIDE (◢HOLD)			
S823	1-572-467-41	SWITCH, PUSH (1 KEY) (◢OPEN)			
		< THERMISTOR >			
⚠THP901	1-810-792-11	SWITCH, POLYETHYLENE			
		< VIBRATOR >			
X501	1-760-173-11	VIBRATOR, CRYSTAL (45.158MHz)			
X801	1-760-174-11	VIBRATOR, CERAMIC (12MHz)			
X802	1-579-886-21	VIBRATOR, CRYSTAL (32.768kHz)			
**********					
	A-3293-253-A	POWER BOARD, COMPLETE			
		**********			
		< CAPACITOR >			
C801	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C802	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C803	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C804	1-162-964-11	CERAMIC CHIP	0.001uF	10%	50V
C805	1-162-927-11	CERAMIC CHIP	100PF	5%	50V
C807	1-162-965-11	CERAMIC CHIP	0.0015uF	10%	50V
C809	1-115-169-11	TANTALUM	10uF	20%	6.3V
C810	1-164-506-11	CERAMIC CHIP	4.7uF		16V
C832	1-162-970-11	CERAMIC CHIP	0.01uF	10%	25V
C837	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C840	1-126-923-11	ELECT	220uF	20%	10V
C841	1-109-982-11	CERAMIC CHIP	1uF	10%	10V
C842	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C843	1-135-259-11	TANTAL. CHIP	10uF	20%	6.3V
C860	1-164-227-11	CERAMIC CHIP	0.022uF	10%	25V
C863	1-164-156-11	CERAMIC CHIP	0.1uF		25V
C899	1-251-470-11	ELEMENT,	STORAGE		
		< CONNECTOR >			
CN805	1-691-362-11	CONNECTOR, FFC/FPC (ZIF) 24P			

Ref. No.	Part No.	Description			Remark
		< DIODE >			
D801	8-719-975-33	DIODE RB110C			
D802	8-719-975-33	DIODE RB110C			
D810	8-719-975-54	DIODE HSM2838C			
D812	8-719-975-33	DIODE RB110C			
		< IC >			
IC806	8-759-331-73	IC MB3800PNF			
IC808	8-729-039-08	IC TRANSISTOR SI6946DQ-T1			
IC809	8-729-039-07	IC TRANSISTOR SI6943DQ-T1			
IC810	8-759-358-71	IC S-80719SL-AG-T1			
		< COIL >			
L802	1-411-803-21	COIL, CHOKE	33uH		
L804	1-414-410-21	INDUCTOR	10uH		
L805	1-414-410-21	INDUCTOR	10uH		
		< TRANSISTOR >			
Q802	8-729-031-34	TRANSISTOR 2SK2034			
Q803	8-729-031-31	TRANSISTOR 2SD2402			
Q804	8-729-822-62	TRANSISTOR 2SB1302-T			
Q805	8-729-120-28	TRANSISTOR 2SC1623-L5L6			
Q807	8-729-029-14	TRANSISTOR DTC144EUA-T106			
Q808	8-729-019-25	TRANSISTOR 2SK1467-TD			
Q813	8-729-028-91	TRANSISTOR DTA144EUA-T106			
Q814	8-729-029-14	TRANSISTOR DTC144EUA-T106			
Q815	8-729-019-25	TRANSISTOR 2SK1467-TD			
		< RESISTOR >			
R801	1-216-789-11	METAL CHIP	2.2	5%	1/16W
R804	1-218-895-11	METAL CHIP	100K	0.50%	1/16W
R805	1-218-895-11	METAL CHIP	100K	0.50%	1/16W
R808	1-216-817-11	METAL CHIP	470	5%	1/16W
R809	1-216-827-11	METAL CHIP	3.3K	5%	1/16W
R810	1-216-827-11	METAL CHIP	3.3K	5%	1/16W
R811	1-216-821-11	METAL CHIP	1K	5%	1/16W
R812	1-216-825-11	METAL CHIP	2.2K	5%	1/16W
R814	1-218-883-11	METAL CHIP	33K	0.50%	1/16W
R815	1-218-863-11	METAL CHIP	4.7K	0.50%	1/16W
R824	1-216-861-11	METAL CHIP	2.2M	5%	1/16W
R825	1-216-857-11	METAL CHIP	1M	5%	1/16W
R846	1-218-875-11	METAL CHIP	15K	0.50%	1/16W
R875	1-216-801-11	METAL CHIP	22	5%	1/16W
R879	1-216-821-11	METAL CHIP	1K	5%	1/16W
R880	1-216-837-11	METAL CHIP	22K	5%	1/16W
R898	1-216-857-11	METAL CHIP	1M	5%	1/16W
		< VARIABLE RESISTOR >			
RV801	1-238-663-11	RES, ADJ, CARBON 4.7K (2.8V ADJUST)			
**********					

The components identified by mark ⚠ or dotted line with mark ⚠ are critical for safety.
Replace only with part number specified.

Les composants identifiés par une marque ⚠sont critiques pour la sécurité.
Ne les remplacer que par une pièce portant le numéro spécifié.

REC SWITCH

Ref. No.	Part No.	Description			Remark
*	1-663-390-11	REC BOARD			
		**********			
		< CAPACITOR >			
C401	1-107-826-11	CERAMIC CHIP	0.1uF	10%	16V
C402	1-107-810-11	TANTAL. CHIP	33uF	20%	4V
C403	1-109-814-11	MICA CHIP	220PF	5%	100V
		< CONNECTOR >			
CN401	1-691-344-11	CONNECTOR, FFC/FPC (ZIF) 6P			
CN402	1-691-344-11	CONNECTOR, FFC/FPC (ZIF) 6P			
		< DIODE >			
D401	8-719-046-86	DIODE F1J6TP			
D402	8-719-046-86	DIODE F1J6TP			
		< TRANSISTOR >			
Q401	8-729-024-44	TRANSISTOR 2SK2315TYTR			
Q402	8-729-024-44	TRANSISTOR 2SK2315TYTR			
Q403	8-729-024-44	TRANSISTOR 2SK2315TYTR			
Q404	8-729-024-44	TRANSISTOR 2SK2315TYTR			
**********					
	A-3306-147-A	SWITCH BOARD, COMPLETE			
		**********			
		< RESISTOR >			
R844	1-218-867-11	METAL CHIP	6.8K	0.50%	1/16W
R845	1-218-871-11	METAL CHIP	10K	0.50%	1/16W
		< SWITCH >			
S804	1-762-851-21	SWITCH, KEY BOARD (VOLUME –)			
S805	1-762-851-21	SWITCH, KEY BOARD (VOLUME +)			
S806	1-762-851-21	SWITCH, KEY BOARD (❚❚)			
**********					
		MISCELLANEOUS			
		**********			
13	1-801-522-11	LCD MODULE			
51	1-473-895-11	SWITCH UNIT (WITH JOG DIAL)			
74	1-777-761-11	WIRE (FLAT TYPE) (24 CORE)			
106	1-651-018-11	SLED FLEXIBLE BOARD			
⚠121	A-3311-140-A	OPTICAL PICK-UP ASSY			
153	1-663-392-11	MD FLEXIBLE BOARD			
161	1-651-017-11	CLV FLEXIBLE BOARD			
M901	1-698-542-11	MOTOR (SPINDLE)			
M902	A-3303-502-A	MOTOR BLOCK ASSY (SLED)			
M903	A-3303-499-A	STEPPER BLOCK ASSY (STEPPING)			
**********					

Ref. No.	Part No.	Description	Remark
		ACCESSORIES & PACKING MATERIALS	
		**********	
⚠	1-467-510-31	ADAPTOR, AC (AC-MZ60A) (US, CND)	
⚠	1-467-511-31	ADAPTOR, AC (AC-MZ60A) (AEP)	
⚠	1-467-511-41	ADAPTOR, AC (AC-MZ60) (E13)	
⚠	1-467-513-21	ADAPTOR, AC (AC-MZ60) (UK, AUS)	
⚠	1-467-514-11	ADAPTOR, AC (AC-MZ60) (E33, Tourist)	
	1-473-109-31	REMOTE CONTROL UNIT	
	1-559-906-32	CORD, CONNECTION (AEP, UK)	
⚠	1-569-007-11	ADAPTOR, CONVERSION 2P (E33, Tourist)	
	1-759-277-21	CASE, BATTERY (EBP-MZR4)	
	1-779-504-11	CONNECTOR, OPTICAL (E13)	
	3-858-529-11	MANUAL, INSTRUCTION (ENGLISH,FRENCH, GERMAN,SPANISH) (CND, AEP, E33, Tourist)	
	3-858-529-21	MANUAL, INSTRUCTION (ENGLISH) (US, UK, AUS, E13)	
	3-858-529-31	MANUAL, INSTRUCTION (DUTCH, SWEDISH, ITALIAN, PORTUGUESE) (AEP)	
	3-858-529-41	MANUAL, INSTRUCTION (JAPANESE,KOREAN, CHINESE) (E13, Tourist)	
	4-973-528-01	CASE, CARRYING	
*	4-987-395-01	CASE, INDIVIDUAL (EXCEPT US)	
*	4-991-504-01	CASE, INDIVIDUAL (US)	
	8-953-091-90	HEADPHONE MDR-E838MP SET (EXCEPT US)	
	8-953-101-90	HEADPHONE MDR-24MP SET (US)	
	X-3329-657-1	ATTACHMENT ASSY (EXCEPT US)	

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Sony Corporation
Personal A&V Products Company

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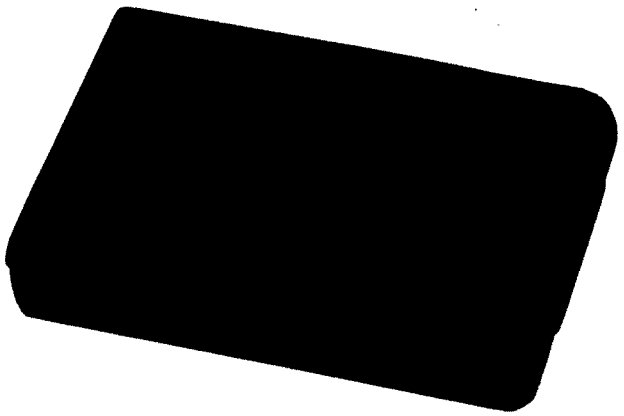
NEW TECHNICAL THEORY FOR SERVICING

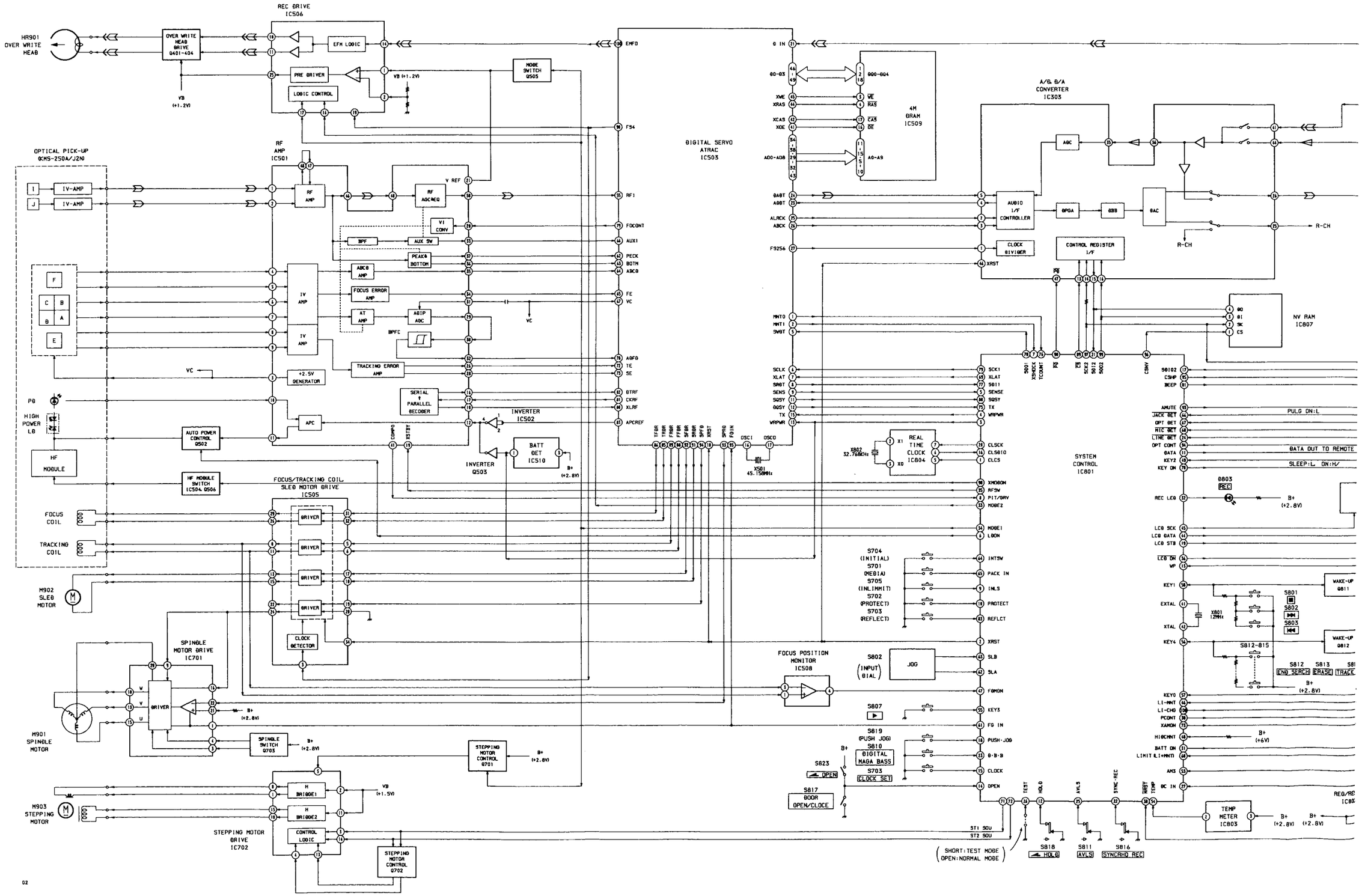
MZ-R30
OPERATION MANUAL

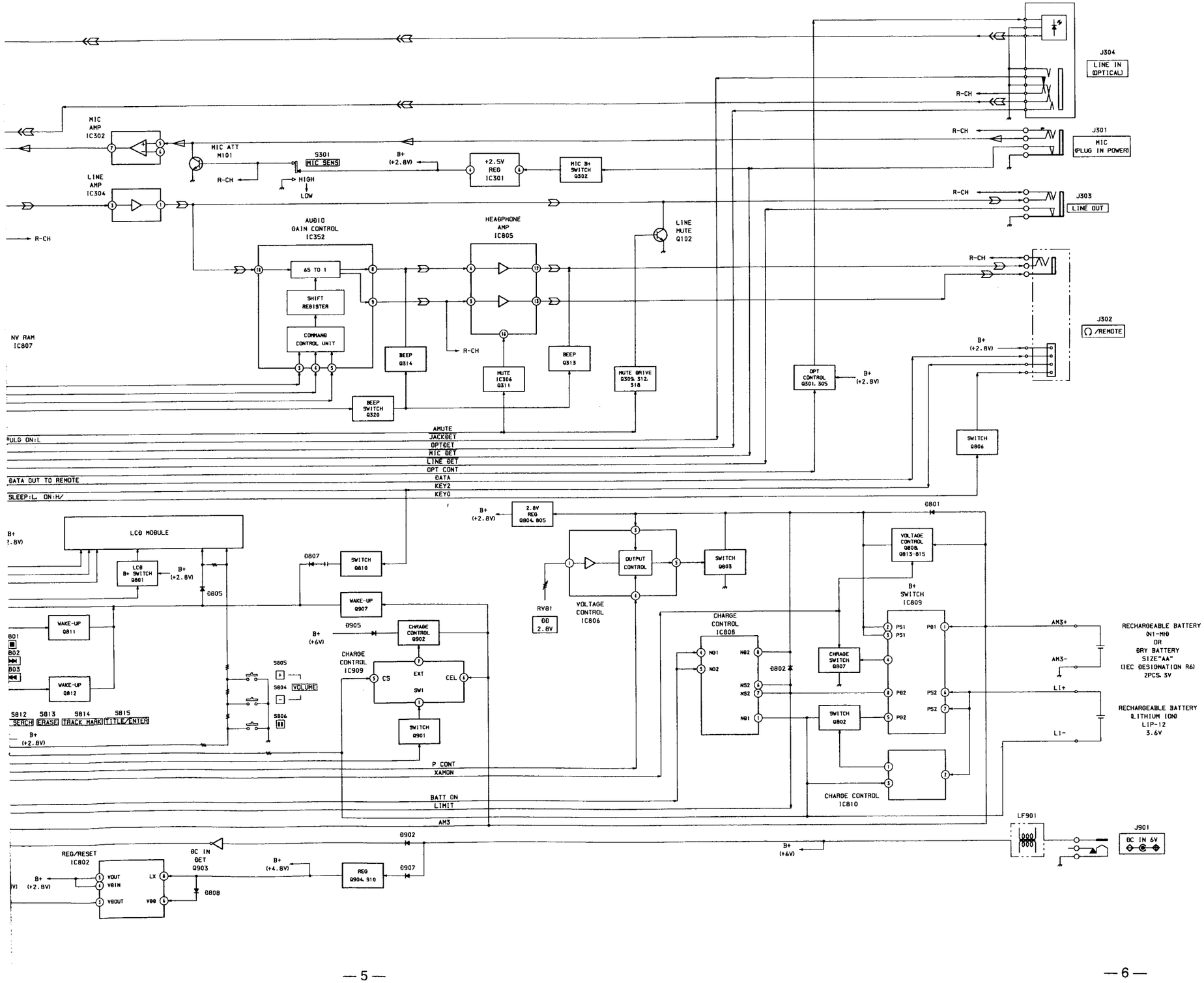


PORTABLE MINI DISC RECODER

SONY

1. BLOCK DIAGRAM




MIC AMP IC302
LINE AMP IC304
MIC ATT M101
S301 MIC SENS
HIGH
LOW
B+ (+2.8V)
+2.5V REG IC301
MIC B+ SWITCH Q302
R-CH
AUDIO GAIN CONTROL IC352
6S TO 1
SHIFT REGISTER
COMMAND CONTROL UNIT
HEADPHONE AMP IC805
LINE MUTE Q102
BEEP Q314
BEEP Q313
MUTE IC306 Q311
MUTE DRIVE Q309, 312, 318
BEEP SWITCH Q320
NV RAM IC807
OPT CONTROL Q501, 505
J304 LINE IN (OPTICAL)
J301 MIC (PLUG IN POWER)
J303 LINE OUT
J302 /REMOTE
SWITCH Q806
AMUTE
JACKDET
OPTDET
MIC DET
LINE DET
OPT CONT
DATA
KEY2
KEY0
PULG ON:L
DATA OUT TO REMOTE
SLEEP:L, ON:H/
LCD MODULE
LCD B+ SWITCH Q801
WAKE-UP Q811
WAKE-UP Q812
S805
S804 VOLUME
S806
S812 SERCH
S813 ERASE
S814 TRACK MARK
S815 TITLE/ENTER
SWITCH Q810
WAKE-UP Q907
CHRAGE CONTROL Q902
CHARGE CONTROL IC909
CS
EXT
CEL
SW1
SWITCH Q901
P CONT
XAMON
BATT ON
LIMIT
AM3
2.8V REG Q804, 805
OUTPUT CONTROL
SWITCH Q803
VOLTAGE CONTROL IC806
RV81
0D 2.8V
Q801
VOLTAGE CONTROL Q808, Q813-815
B+ SWITCH IC809
CHARGE CONTROL IC808
CHRAGE SWITCH Q807
SWITCH Q802
CHARGE CONTROL IC810
AM3+
AM3-
LI+
LI-
RECHARGEABLE BATTERY NI-MH OR DRY BATTERY SIZE "AA" (IEC DESIGNATION R6) 2PCS. 3V
RECHARGEABLE BATTERY LITHIUM ION LIP-12 3.6V
LF901
J901 DC IN 6V
REG/RESET IC802
VOUT
VBIN
VBOUT
LX
VSS
DC IN DET Q903
REG Q904, 910
Q801
Q802
Q803
Q805
Q807
Q808
Q902
Q907
Q909

2. FUNCTIONS AND FEATURES

This unit is the fourth generation version of the MZ series equipped with the following new functions in addition to the functions of the 3rd generation unit (MZ-R3, MZ-B3, etc.).

• Built-in sampling rate converter:
Enables digital recording by connecting with a digital equipment with different sampling frequency such as DAT deck and Digital satellite tuner.
(Sampling frequency:Corresponds to 32 kHz, 44.1 kHz, 48 kHz)

• New method corresponding to monaural recording:
Usual portable unit such as MZ-R3 has a monaural recording method of (L-ch + R-ch) /2 for analogue and a monaural recording method of only L-ch for digital, but this unit can have a monaural recording method of (L-ch + R-ch) /2 for also digital.
The monitor output in the monaural recording mode with digital is still keeping stereo.

• Compatible with synchro-recording:
Digital-recording from a digital equipment such as a CD player connected using an optical digital cable to this unit is simple without the need to operate both the source to be recorded and this unit.

• Track search
This unit is capable of searching for another music while playing a music, and accessing that music.
When the jog dial is rotated while a music is being played, the music name and track number will be displayed on the display sequentially. The desired music can therefore be accessed by just pressing the jog dial when it is displayed.
(This is possible during play and pause.)

• Charging circuit for reachargeable lithium ion battery *2-1:
The charging circuit of the 3rd generation unit used for rechargeable nickel hydrogen battery has been changed to that for the rechargeable lithium ion battery in this unit.

*2-1: This unit cannot recharge rechargeable nickel hydrogen battery.
Use the optional battery charger (BC-DM20) for this type of battery.

The following shows the differences between the 3rd generation and 4th generation units.

Table. 2-1 Comparison of 3rd Generation and 4th Generation Recording/Playback Units

Unit Functions	MZ-B3	MZ-R3	MZ-R30
Play VOLUME	Rotation mechanism	Electronic VOL	Electronic VOL
Remote control	×	○	○
Headphone output	○	○	○
Line output	×	○	○
Digital output	×	×	×
Line input	×	○	○
Digital input	×	○	○
Microphone input	○ (Built-in:Monaural External:Stereo)	○ (External:Stereo)	○ (External:Stereo)
AVLS	×	○	○
DBB (Digital bass boost)	×	○	○
RESUME	○ (Always ON)	○ (Always ON)	○ (Always ON)
Beep	×	○	○
Recording method	AGC only	AGC or manual	AGC or manual
Synchro-recording	×	×	◎
Monaural recording	○ Analogue : (L-ch + R-ch) /2 Digital : L-ch only	○ Analogue : (L-ch + R-ch) /2 Digital : L-ch only	◎ Analogue : (L-ch + R-ch) /2 Digital : (L-ch + R-ch) /2
Monaural playback	○	○	○
Automatic track mark	×	○	○
Fast forward playback	○	×	×
Track search	×	×	◎
Character input	×	○	○
Built-in sampling rate converter	×	×	◎ (32, 44.1, 48 [kHz])

Note: ◎ in the table indicates a new function.

3. DIFFERENCE IN SYSTEM STRUCTURE BY GENERATION

3-1. Main ICs Used by Generation

The portable type mini disc recorder is composed of the main LSIs shown in **Table. 3-1.** The main difference between the 1st and 2nd generations is that the 1st generation has one ATRAC ENC/DEC IC for the L-ch and R-ch each, while the 2nd generation integrates them into one LSI. In the 3rd generation, many ICs have increasingly been integrated- ATRAC ENC/DEC IC and the shock proof memory controller IC have been integrated into one IC, and the EFM ACIRC ENC/DEC IC, ADIP demodulator IC, and servo signal processor IC have been integrated into one IC. With the 4th generation, the functions integrated into the two ICs of the 3rd generation have been integrated into one IC to realize one chip mini disc processor IC. The main LSIs of the 4th generation are outlined below.

CXD2652R : CXD2536 + CXD2535 + new functions (SAMPLING RATE CONVERTER, etc.)
CXA2523R*3-1 : I-V amplifier with level adjustment switch + RF amplifier

*3-1: The CXA2523R has less adjustment points and external parts compared with the RF AMP IC (CXA1981AQ/AR) of the 3rd generation, thus realizing less power consumption.

Table. 3-1 Main ICs Used

	1st Generation	2nd Generation	3rd Generation	4th Generation
Corresponding model / Circuit block	MZ-1	MZ-R2	MZ-R3, B3	MZ-R30
ATRAC encoder/decoder	CXD2527R (x2)	CXD2531AR	CXD2536R	CXD2652R
Shock proof Memory controller	CXD2526Q	CXD2526AR		
EFM ACIRC Encoder/decoder	CXD2525R	CXD2525R	CXD2535BR	
ADIP Demodulator	CXA1380N	CXA1380N		
Servo Signal processor	CXA1602R	CXA1602R		
RF amplifier	CXA1381R	CXA1861R	CXA1981AR	CXA2523R

3-2. Outline of System by Generation

• 1st generation (MZ-1)

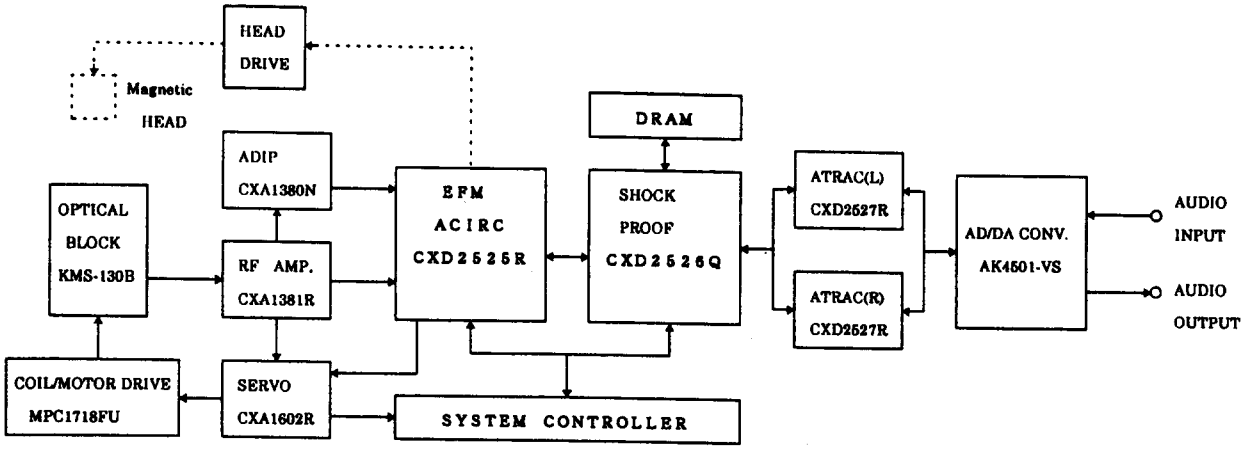


Fig. 3-1 1st Generation Mini Disc System

• 2nd generation (MZ-R2)

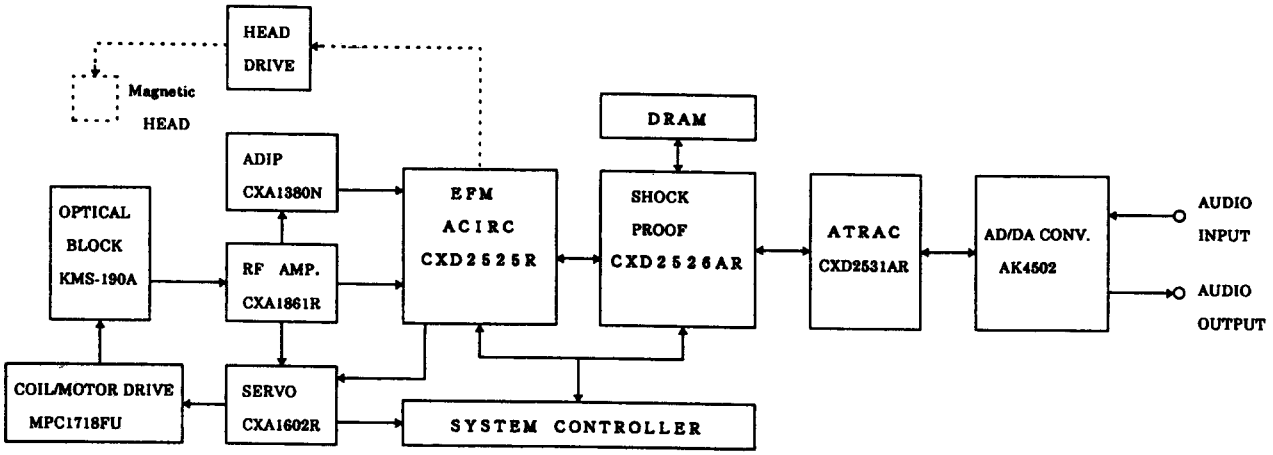


Fig. 3-2 2nd Generation Mini Disc System

• 3rd generation (MZ-R3, B3)

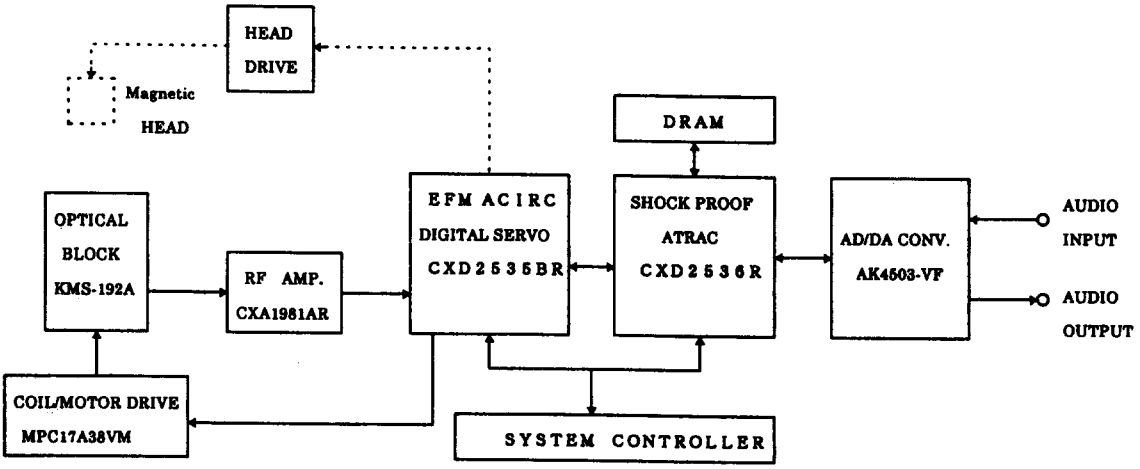


Fig. 3-3 3rd Generation Mini Disc System

• 4th generation (MZ-R30)

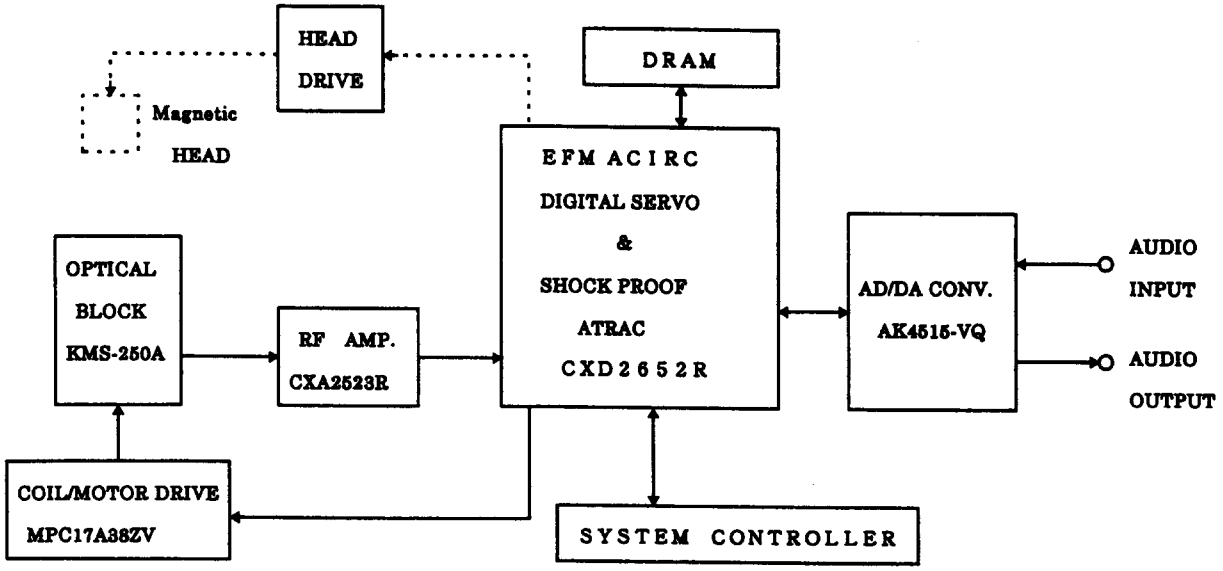


Fig. 3-4 4th Generation Mini Disc System

4. SYSTEM CONFIGURATION

4-1. System Configuration

Fig. 4-1 shows and the following briefly describes the system configuration of this unit.
First, the flow of signals during recording is described.
The microphone input passed through the microphone amplifier IC302 or LINE input is input to the AD/DA converter IC303, converted to 16-bit digital data by the internal AD converter, and output to the DSP IC503. Next, the sound source of the digital input is input directly to the DSP IC503. The digital data input is performed signal processing (compression, interleave, EFM modulation, etc.) inside IC503. The EFM signal generated is recorded on the MO disc via the REC drive IC506.

Next, the flow of signals during playback is described.
The signal read by the optical pickup is input to the DSP IC503 via the RF amplifier IC501. Inside the DSP IC503, signal processing (EFM demodulation, deinterleave, expansion, etc.) of the EFM signal is performed and the digital data is output to the AD/DA converter IC303 after signal processing. The digital data input to the AD/DA converter IC303 is output as the analog signals of the L-ch and R-ch via the internal DBB (digital bass boost) circuit, digital filter, and DA converter. The analog signal output is output from the headphone via the buffer IC304, audio gain control IC352, and H.P. amplifier IC805. LINE OUT is output via the buffer IC304.

Next, the flow of the servo signal is described.
The signal read by the optical pickup is output to the DSP IC503 via each error amplifier inside the RF amplifier IC501. In the DSP IC503, the input error signal is subjected to servo calculation by the internal digital servo signal processor to generate the servo signal. The servo signal is then output and used to drive coils and motors via the coil/motor drive IC505.

Finally, the system controller IC801 is described. This system controller IC801 controls the whole system.
The main controls and input control are described below.

- ♦ DSP IC503 control : • Control of each servo processor
  • Switching of the mode (recording/playback) of each signal processor
  • Control of input sound source (AD DATA or DIGITAL DATA)

- ♦ RF amplifier IC501 control : Switching of RF amplifier mode (PIT/GROOVE), etc.
- ♦ Audio gain control IC352 control : Control of output volume
- ♦ AD/DA converter IC303 control : Control of input sound source (MIC input or LINE input), control of DBB circuit, etc.
- ♦ NV RAM IC807 control : Control of E-F balance values during servo processing, etc.
- ♦ Stepping motor drive IC702 control
- ♦ REC drive IC506 control
- ♦ Jog dial, key, switch input control
- ♦ Internal temperature control
- ♦ Clock information control
- ♦ LCD drive

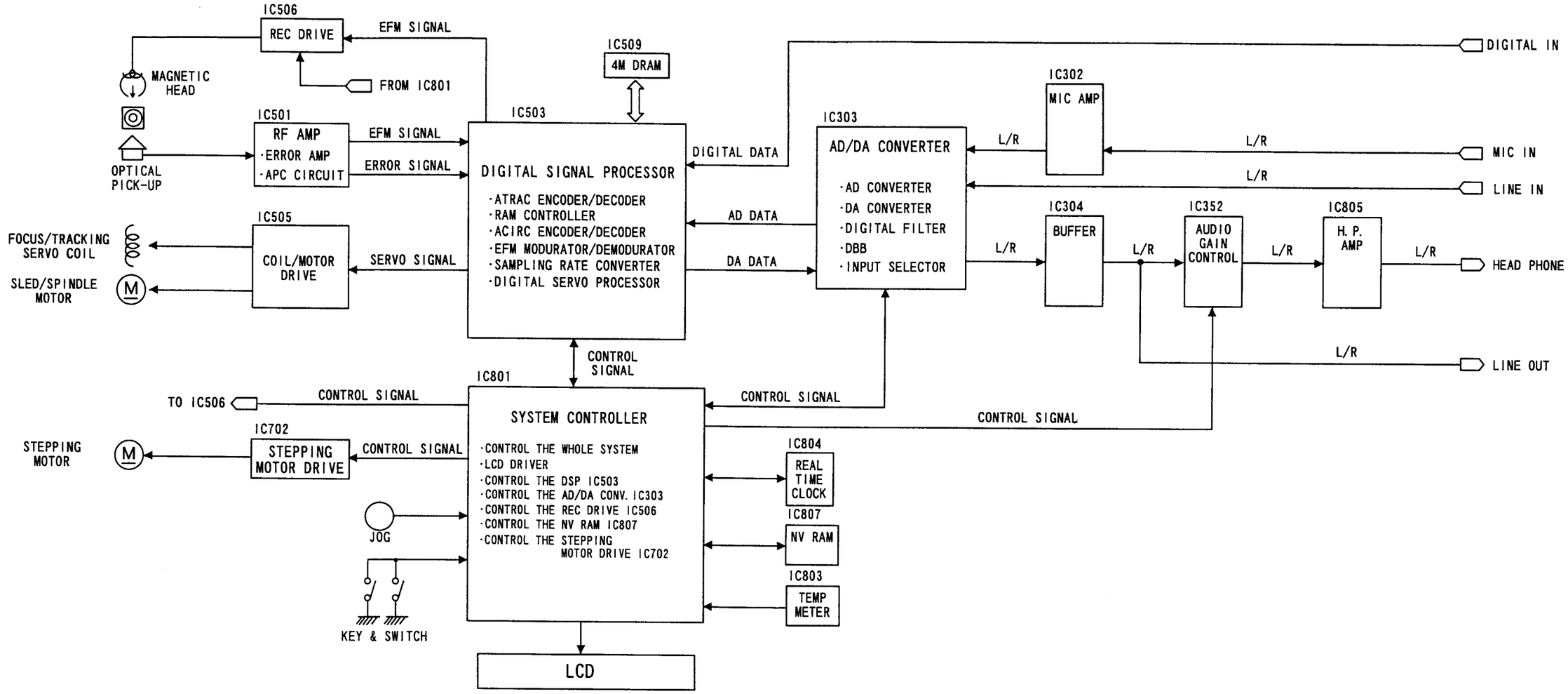


Fig. 4-1 System Configuration

4-2. Microprocessor Interface

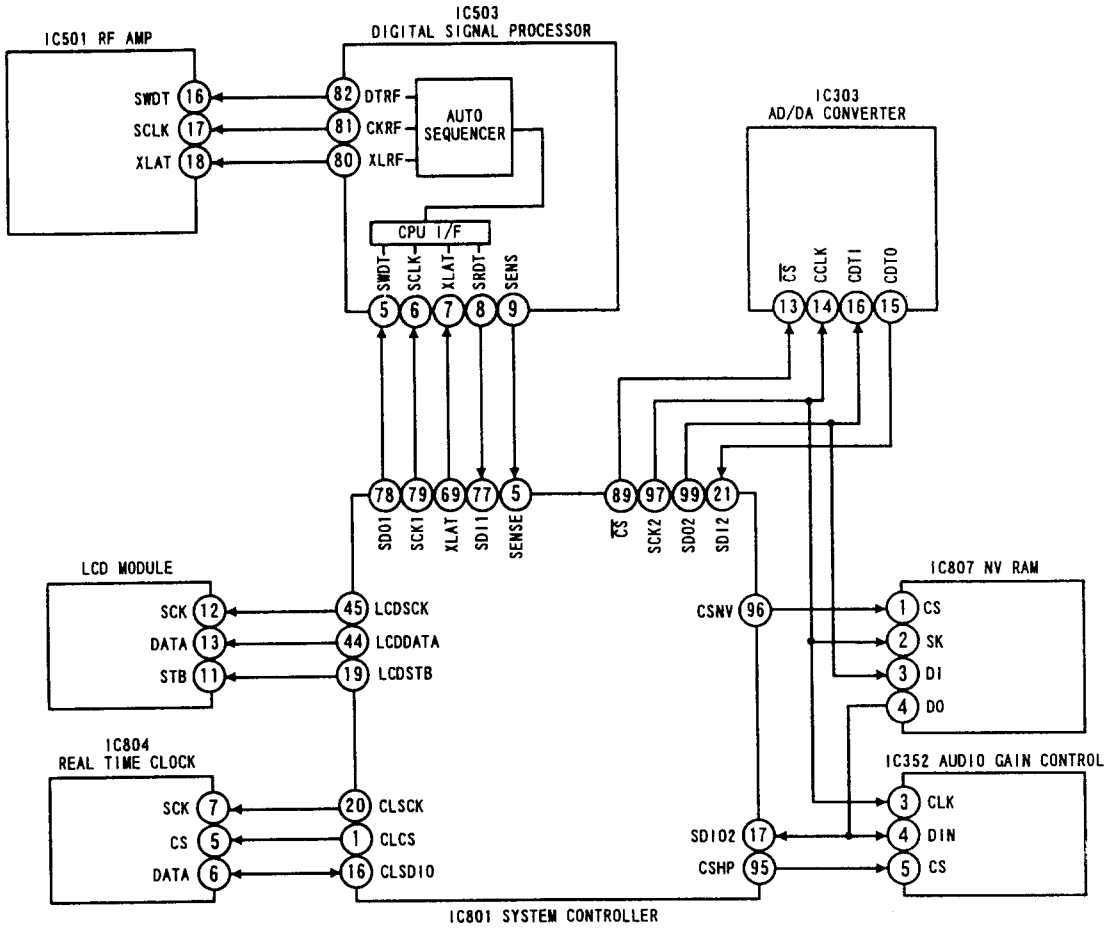


Fig. 4-2 Microprocessor Interface

Fig. 4-2 shows the microprocessor interface of this unit.

1. Communication between system controller IC801, digital signal processor IC503, and RF amplifier IC501

The system controller IC801 controls the DSP IC503 and RF amplifier IC501 by sending various commands in serial data. These serial data synchronize with the clock of Pin ⑲ [SCK1] and latch signal of Pin ⑲ [XLAT], and are output from Pin ⑱ [SDO1]. The serial data input to DSP IC503 is divided into the commands for the DSP IC and commands for the RF amplifier IC by the auto sequencer circuit inside IC503. The commands for the RF amplifier synchronize with the clock of Pin ⑧① [CKRF] and latch signal of Pin ⑧⓪ [XLRF], and are output from Pin ⑧② [DTRF]. The IC501 and IC503 start operating according to the commands input when the latch signal input becomes "L".

The DSP IC503 may in some cases return data corresponding to the input commands to the system controller IC801. In such cases, data is output using the Pin ⑧ [SRDT] and Pin ⑨ [SENS] output terminals.

The main interfaces are described below.

- ◆ Communication with DSP IC503:
  - Control of various servo processes (such as auto sequence command of focus search, etc.)
  - Switching of signal processor modes (recording/playback)
  - Selection of input sound sources (ANALOG or DIGITAL)
  - Switching of recording mode (stereo/monaural) during digital recording, etc.
- ◆ Control of RF amplifier IC501:
  - Switching of RF amplifier mode (PIT/GROOVE), etc.

2. Communication between system controller IC801 and AD/DA converter IC303

To control the AD/DA converter IC303, the system controller IC801 synchronizes the serial data with the clock of Pin ⑨⑦ [SCK2] and chip select signal of Pin ⑧⑨ [$\overline{CS}$], and output the data from Pin ⑨⑨ [SDO2] to the AD/DA converter IC303. IC303 starts operating according to the command input when the chip select signal input becomes "L". The main interfaces are described below.

- Control of DBB circuit (ON/OFF of DBB circuit, switching of mode (BASS1/BASS2))
- Selection of input sound source (MIC IN/LINE IN)
- ON/OFF of AD converter
- ON/OFF of DA converter
- Switching of recording mode (stereo/monaural) during analog recording, etc.

3. Communication between system controller IC801 and LCD module

The system controller IC801 synchronizes the data to be displayed on the LCD with the clock of Pin ④⑤ [LCDSCK] and the strobe signal of Pin ①⑨ [LCDSTB] and outputs it from Pin ④④ [LCDDATA]. This drives the LCD module.

4. Communication between system controller IC801 and real time clock IC804

The system controller IC801 synchronizes data such as clock setting, etc. with the clock of Pin ②⓪ [CLSCK] and chip select signal of Pin ① [CLCS], and outputs the data from Pin ①⑥ [CLSDIO] to the REAl TIME CLOCK IC804. The REAL TIME CLOCK IC804 synchronizes the clock information with these input signals, and outputs the information to Pin ①⑥ [CLSDIO] of the system controller IC801. Through this communication, the system controller IC obtains the clock information.

5. Communication between system controller IC801 and NV RAM IC807

The system controller IC801 writes data used for servo processing such as the focus bias value and E-F balance value in the NV RAM IC807. It synchronizes these data with the clock from Pin ⑨⑦ [SCK2] and chip select signal of Pin ⑨⑥ [CNSV], and outputs the data from Pin ⑨⑨ [SDO2] to the NV RAM IC807. In servo processing, serial data (read command) is synchronized with the clock of Pin ⑨⑦ [SCK2] and the chip select signal of Pin ⑨⑥ [CSNV] (in the same manner as for writing) and output from Pin ⑨⑨ [SDO2] to the NV RAM IC807. When the NV RAM IC807 receives the read command, it outputs the corresponding data from Pin ④ [DO] to Pin ①⑦ of the system controller IC801 [SDIO2]. Through this communication, the system controller IC801 carries out servo processing smoothly.

6. Communication between system controller IC801 and audio gain control IC352

The system controller IC801 synchronizes the data corresponding to the volume data input with the clock of Pin ⑨⑦ [SCK2] and chip select signal of Pin ⑨⑤ [CSHP], and outputs the data from Pin ①⑦ [SDIO2] to the audio gain control IC352. Through this communication, the system controller IC801 carries out volume adjustments.

5. POWER CIRCUIT

5-1. Types of Power Supply

This unit can operate on the following four types of power supplies.

- AC adapter (AC-MZ60) ... 6.0 [V] (Accessory)
- Rechargeable lithium ion battery (LIP-12 (H)) ... 3.6 [V] (Accessory)
- Dry battery (SIZE "AA" dry battery x 2) ... 3.0 [V] (Optional)
- Rechargeable nickel hydrogen battery (BP-DM20) ... 2.4 [V] (Optional)

Table. 5-1 shows how long the respective batteries will last in continued use.
As shown in **Table. 5-1**, compared to MZ-R3, batteries can last twice longer according to how they are combined.

Table. 5-1 Comparison of Durability of Batteries (MZ-R3, MZ-R30)

No.	Battery	MZ-R3		MZ-R30	
		During Recording	During Playback	During Recording	During Playback
1.	Rechargeable lithium ion battery (LIP-12 (H))	Approx. 2.5 hours	Approx. 4 hours	Approx. 5 hours	Approx. 8 hours
2.	SONY alkaline dry battery (LR6 (SG)x2)	Approx. 2 hours	Approx. 4 hours	Approx. 3 hours	Approx. 6.5 hours
3.	Rechargeable nickel hydrogen battery (BP-DM20)	Approx. 2 hours	Approx. 3 hours	Approx. 3 hours	Approx. 4.5 hours
4.	1+2	Approx. 4.5 hours	Approx. 8 hours	Approx. 8.5 hours	Approx. 15 hours
5.	1+3	Approx. 4.5 hours	Approx. 7 hours	Approx. 8.5 hours	Approx. 14.5 hours

5-2. Differentiation of Power Supply

The system controller IC801 when started, will immediately determine where the power supply voltage is being supplied from. The unit must be stopped if AC adapter and batteries outside the specification are used.
The system controller IC determines the source of power supply from the following three detection results.

(1) Pin ⑲ [UNMNT] : Voltage obtained by resistance-dividing the voltage of the plus side of the power supply (UNREG voltage)
(2) Pin ⑳ [LIMNT (LI+MNT)] : Voltage obtained by resistance-dividing the lithium ion battery voltage
(3) Pin ⑬ [AM3] : Voltage obtained by resistance-dividing the nickel hydrogen battery voltage or the dry battery voltage.

Table. 5-2 List for Differentiating the Power Supply

	Pin ⑲ [UNMNT]	Pin ⑳ [LIMNT (LI+MNT)]	Pin ⑬ [AM3]
During DC drive	H	L	L
During rechargeable lithium ion battery drive	H	H	L
During rechargeable nickel hydrogen battery drive	H	L	H
During alkaline AA dry battery drive	H	L	H

5-3. Circuit Voltage

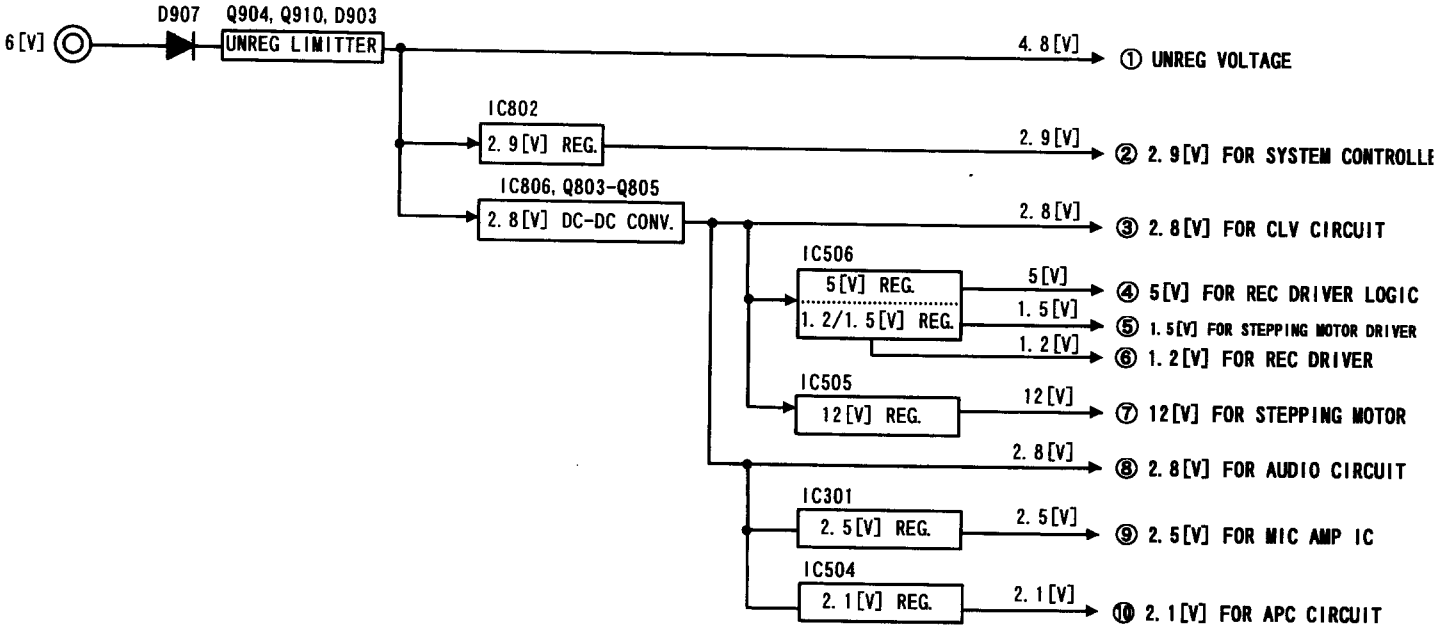


Fig. 5-1 Generation Voltage Block Diagram

The voltages generated by this unit during DC drive are as follows. (**See Fig. 5-1.**)

① **UNREG voltage → [Q904, Q910, D903]**
- This UNREG voltage 4.8 [V] is generated from the 6[V] of the AC adapter.
- Serves as the driver power supply of the coil/motor drive IC505.

② **MICON +B voltage → [RESET IC802]**
- 2.9 [V] serving as the voltage for driving the system controller IC801.

③ **CLV circuit voltage → [2.8 [V] DC-DC converter (IC806, Q803-Q805)]**
- 2.8 [V] serving as the voltage used by the CLV circuit (RF amplifier IC501, DSP IC503, coil/motor drive IC505, etc.).

④ **REC driver logic voltage → [5[V] REG. (IC506)]**
- 5.0 [V] serving as the voltage for driving the internal logic circuit of the REC driver IC506.

⑤ **Stepping motor driver voltage → [1.2/1.5[V] REG. (IC506)]**
- 1.5 [V] serving as the H bridge power supply voltage of the stepping motor.

⑥ **REC driver voltage → [1.2/1.5[V] REG. (IC506)]**
- 1.2 [V] serving as the power supply voltage of the overwrite head driver during recording.

⑦ **Stepping motor voltage → [12]V] REG. (IC505)]**
- 12 [V] serving as the voltage for the predriver power supply circuit inside IC505.
- 12 [V] serving as the voltage for driving the stepping motor.

⑧ **AUDIO circuit voltage → [2.8[V] DC-DC converter (IC806, Q803-Q805)]**
- 2.8[V] used by the audio circuit (AD/DA converter IC303, audio gain control IC352, etc.)

⑨ **MIC AMP IC voltage → [2.5 [V] REG. (IC301)]**
- 2.5 [V] serving as the voltage for driving the MIC amplifier IC302.

⑩ **APC circuit voltage → [2.1 [V] REG. (IC504)]**
- 2.1 [V] serving as the voltage used by the APC circuit during recording.

Each voltage is described in detail below.

1. Generation of UNREG voltage

When the DC plug is inserted in the DC jack, 6[V] is input to the UNREG LIMITER circuit composed of Q904, Q910, and D903 via D907, 4.8 [V] is output from the Q904 and Q910 emitters to generate the UNREG voltage.

2. Generation of MICON +B voltage

When the UNREG voltage is input to Pin ⑥ [VDD] of IC802, 2.9 [V] is output from Pin ⑤ [VOUT] by the series regulator inside IC802. IC802 incorporates a VDD power supply voltage detection circuit inside. When the voltage input to Pin ⑥ [VDD] is lower than 3.4 [V], the voltage is maintained above 3.4 [V] by self-step up performed by L801, D808, C831, and the switching output of Pin ⑧ [LX].

3. Generation of APC circuit voltage

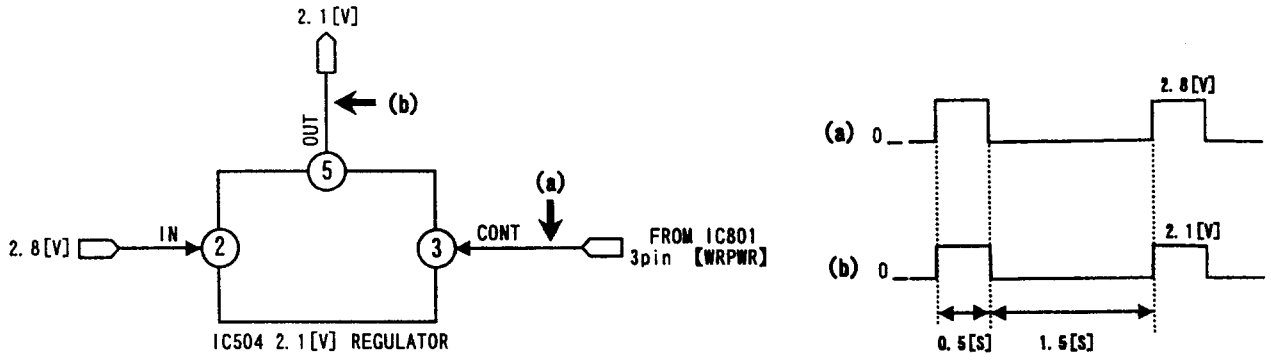


Fig. 5-2 2.1 [V] Regulator

Fig. 5-2 shows the 2.1 [V] regulator IC504. As shown in the figure, when 2.8 [V] is input to Pin ② [IN] of IC504, IC504 is started. When IC504 is started, 2.1 [V] is generated by the internal series regulator. This voltage is then synchronized with the "H" period of the laser power switching signal from Pin ③ [WRPWR] of the system controller IC801 input to Pin ③, and output from Pin ⑤ [OUT].

4. Generation of the CLV circuit voltage and the voltage for Audio circuit

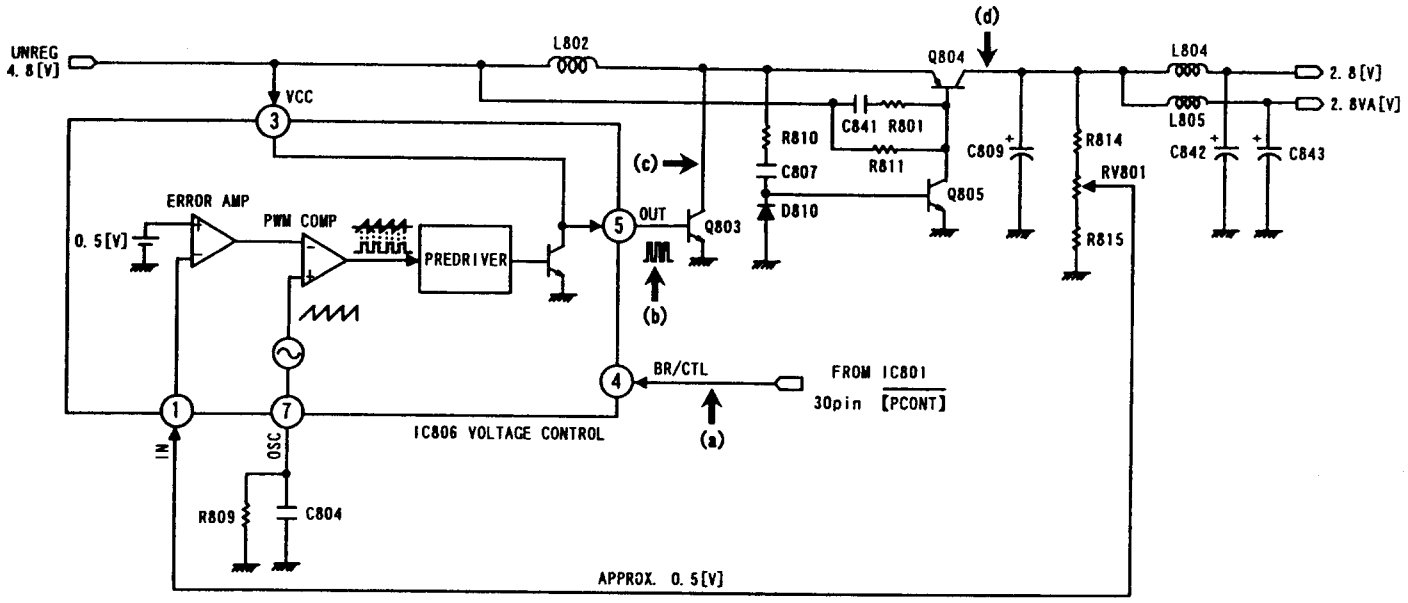


Fig. 5-3 2.8 [V] DC-DC converter circuit

Fig. 5-3 shows the block diagram of the 2.8 [V] DC-DC converter circuit. When the UNREG voltage (4.8 [V]) is input to Pin ③ [VCC] of the voltage control IC806 and the output from Pin ㉚ [$\overline{\text{PCONT}}$] of the system controller IC801 becomes "L", IC806 is started. When IC806 is started, the PWM wave generated by the PWM comparator inside is output from Pin ⑤ [OUT]. Q803, Q804, and Q805 start switching as a result of this PWM wave output, and the STEP-DOWN DC-DC CONVERTER circuit is started. After the Q804 output is smoothed by C809, the voltage resistance-divided by R814, RV801, and R815 is fed back to Pin ① [IN] of IC806. Based on this feed back, IC806 control the voltage by controlling the PWM wave duty generated by the PWM comparator inside. As a result of this operation, the CLV circuit voltage 2.8 [V] and AUDIO circuit voltage 2.8 VA [V] are generated.

Next, the SLEEP function is described. During battery driving by rechargeable lithium ion battery, etc., this unit performs SLEEP operation to achieve low power consumption. When the unit stops, after approximately 10 seconds, the system controller IC801 sets the output of Pin ㉚ [$\overline{\text{PCONT}}$] to "H", to stop the IC806 operations. As a result, the 2.8 [V] DC-DC CONVERTER circuit is set into the STOP state.

Fig. 5-4 shows the (a) to (d) waveforms of **Fig. 5-3**.

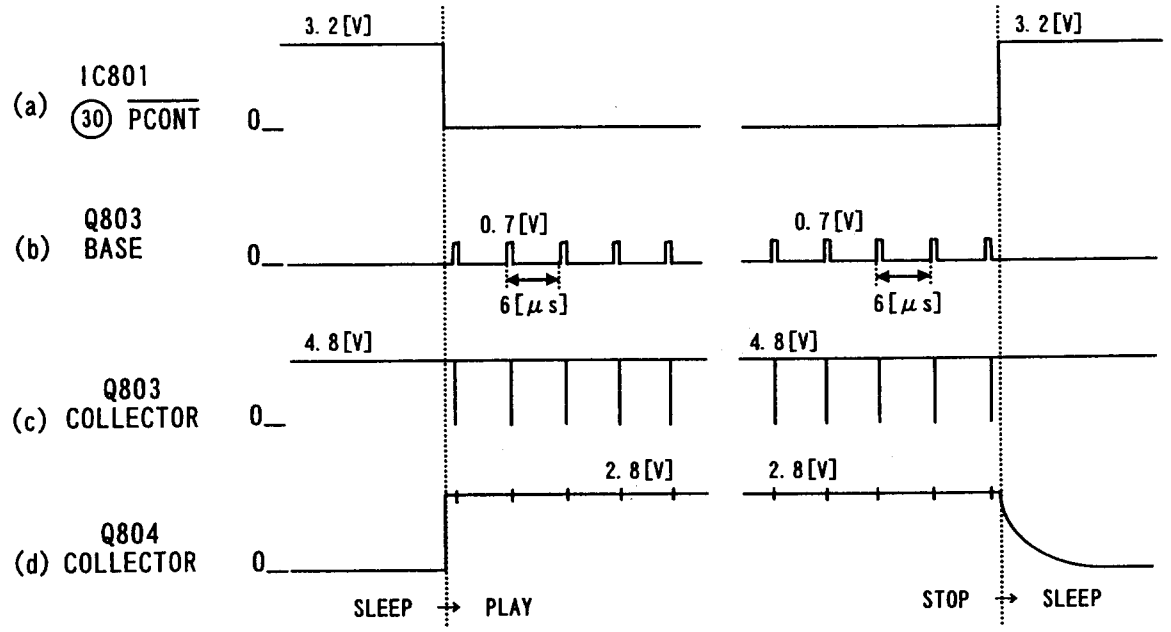


Fig. 5-4 Waveform Timing Diagram (During Battery Drive)

5. Generation of voltage for REC driver logic

The step-up converter composed of Pin ⑦ [VG] of the REC driver IC506, L514, D502, and C565 generate 5 [V] from 2.8 [V], and uses it as the voltage for the internal logic of IC506.

6. Generation of stepping motor driver voltage/REC driver voltage

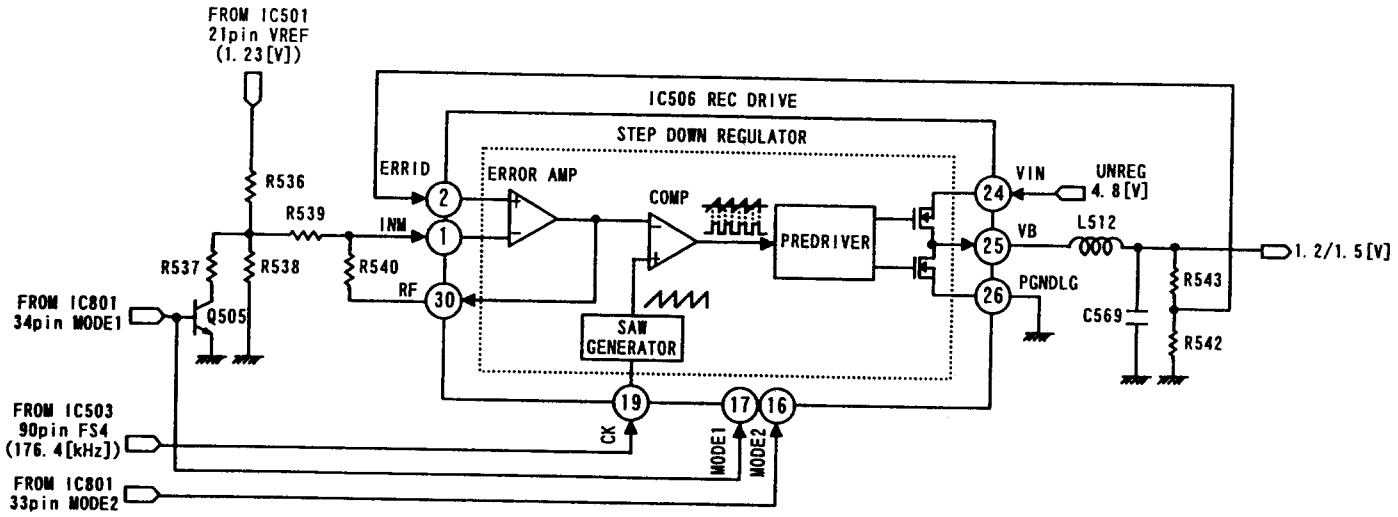


Fig. 5-5 1.2/1.5 [V] Regulator Block Diagram

Fig. 5-5 shows the block diagram of the 1.2/1.5 [V] regulator and **Table. 5-3** shows the mode setting table of the REC driver IC506. As shown in this table, IC506 switches the internal operation mode according to the control signal of Pin ㉞ [MODE1] and Pin ㉝ [MODE2] of the system controller IC801. During stepping motor driving, the system controller IC801 outputs "L" from Pin ㉞ [MODE1] and "L" from Pin ㉝ [MODE2]. Q505 is turned OFF by this "L" output of [MODE1], and as a result, the STEP DOWN REGULATOR inside IC506 becomes the 1.5 [V] REGULATOR, and 1.5 [V] is output from Pin ㉕ [VB] of IC506.

Next, the system controller IC801 outputs "H" from Pin ㉞ [MODE1] and "L" from Pin ㉝ [MODE2] during recording. Q505 is turned ON by this "H" output of [MODE1]. As a result, the STEP DOWN REGULATOR inside IC506 becomes the 1.2 [V] REGULATOR, and 1.2 [V] is output from Pin ㉕ [VB] of IC506. In this way, the STEP DOWN REGULATOR inside IC506 is switched by changing the reference voltage of the ERROR amplifier by turning ON or OFF Q505.

The sawtooth wave generated inside IC506 is generated based on the 176.4 [kHz] output from Pin ㊱ [FS4] of the DSP IC503.

Table. 5-3 List of IC506 Mode Settings

MODE1	MODE2	STEP UP REG	STEP DOWN REG	EFM Logic Section	Operation Mode
H	H	STOP	STOP	STOP	During stop and playback
L	H	POWER ON	STOP	STOP	Not used
L	L	POWER ON	POWER ON 1.5 [V] output	STOP	During stepping motor operation
H	L	POWER ON	POWER ON 1.2 [V] output	POWER ON	During recording

7. Generation of Stepping Motor Voltage

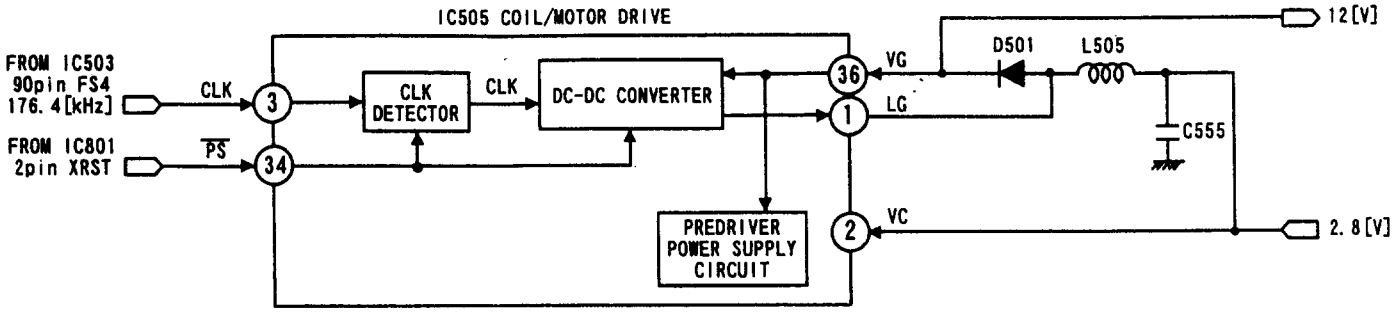


Fig. 5-6 12 [V] DC-DC CONVERTER Block Diagram

Fig. 5-6 shows the block diagram of the 12 [V] DC-DC converter. The coil/motor drive IC505 incorporates a DC-DC converter circuit. The DC-DC converter circuit starts operating when connected with the external coil (L505), switching diode (D501), and smoothing capacitor (C555) and generates the voltage for the PREDRIVER power supply circuit inside IC505 and 12 [V] voltage for the stepping motor. This DC-DC converter circuit synchronizes with the clock (176.4 [kHz]) from Pin ⑨⓪ [FS4] of the DSP IC503, and operates.

8. Generation of MIC AMP IC voltage

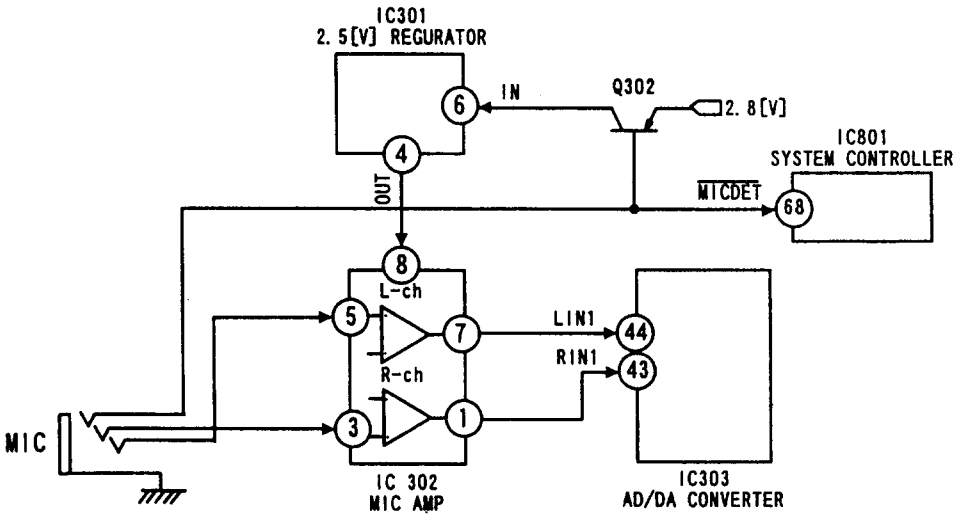


Fig. 5-7 Generation of MIC AMP IC302 Drive Voltage

Fig. 5-7 shows the block diagram of the generation of the voltage for the MIC amplifier IC. As shown in the figure, when a plug is inserted into the MIC jack, the input of Pin ⑥⑧ [$\overline{\text{MICDET}}$] of the system controller IC801 becomes "L", and Q302 is turned "ON" by this "L" signal. As a result, 2.8 [V] is input to Pin ⑥ of the 2.5 [V] REGULATOR IC301, and IC301 is started. When it starts, 2.5 [V] generated by the series regulator inside is output from Pin ④ and the MIC amplifier IC302 starts.

5-4. Operations in Use of Rechargeable Lithium Ion Battery

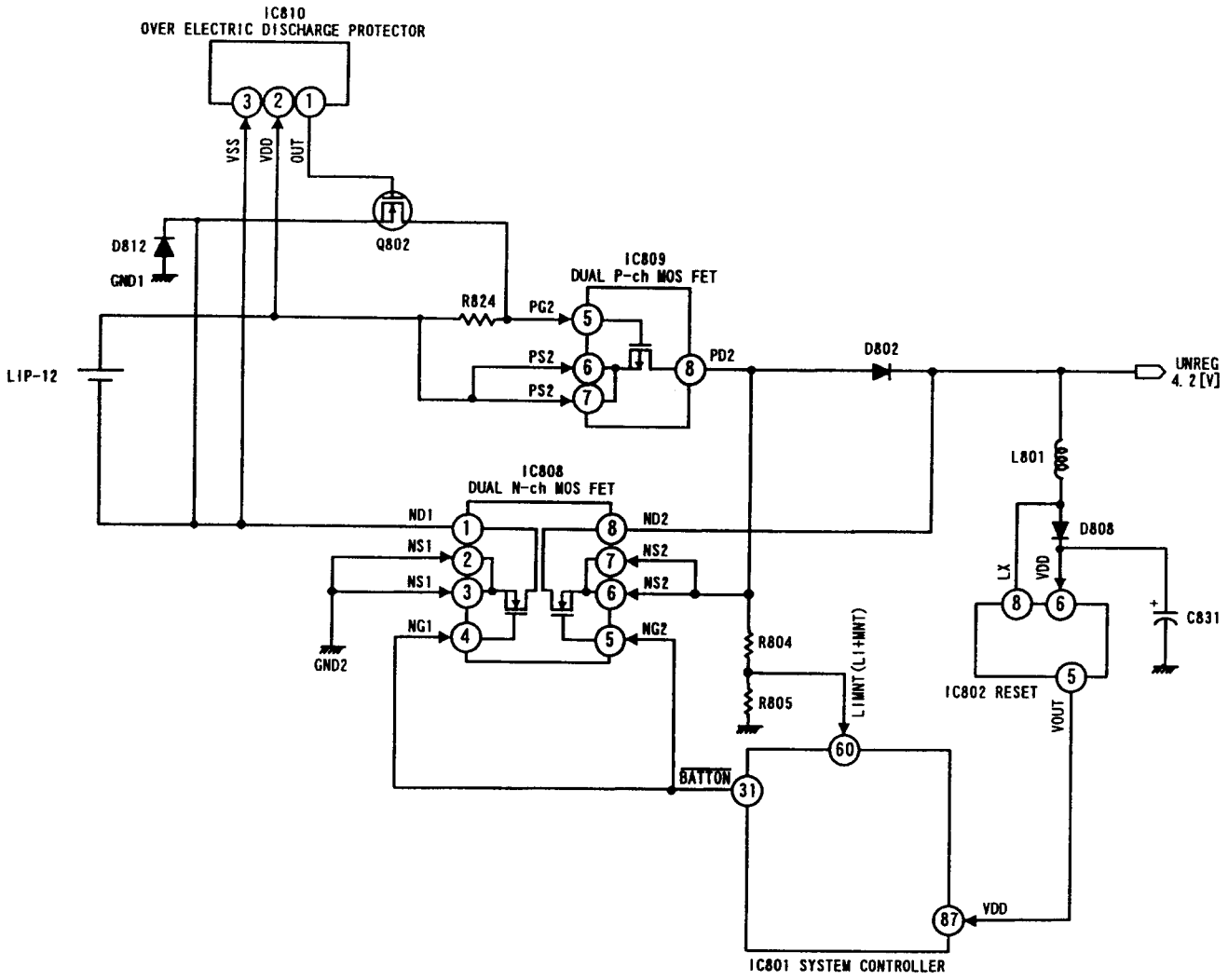


Fig. 5-8 Power Supply Circuit when Driving with Rechargeable Lithium Ion Battery

Fig. 5-8 shows the power supply circuit when driving with the rechargeable lithium ion battery. When the rechargeable lithium ion battery is inserted, the voltage of the rechargeable battery is input to Pin ② [VDD] of the over electric discharge protector IC810 and IC810 is started. When started, "H" is output from Pin ① [OUT]. Q802 is turned ON by this "H" output, and the P channel FET inside the DUAL P-ch MOS FET IC809 is turned ON. As a result, a 4.2 [VMAX] UNREG voltage is output from Pin ⑧ [PD2] of IC809, and input to Pin ⑧⑦ [VDD] of the system controller IC801 via the reset IC802. When the system controller IC801 is started, it detects if the rechargeable lithium ion battery is connected using Pin ⑥⓪ [LIMNT (LI+MNT)]. When it determines that the battery is connected, it outputs "H" from Pin ③① [$\overline{\text{BATTON}}$]. The N channel FET inside the dual N-ch MOS FET IC808 is turned ON by this "H" output. As a result, the minus side of the rechageable lithium ion battery is connected to GND2. At the same time, a 4.2 [VMAX] UNREG voltage is output from Pin ⑧ [ND2].

■ Output of voltages

Voltage supply is performed in the same manner as during DC driving. For details, refer to ③ to ⑧ in **5-3. Circuit Voltage.**

5-5. Operations in Use of External Battery

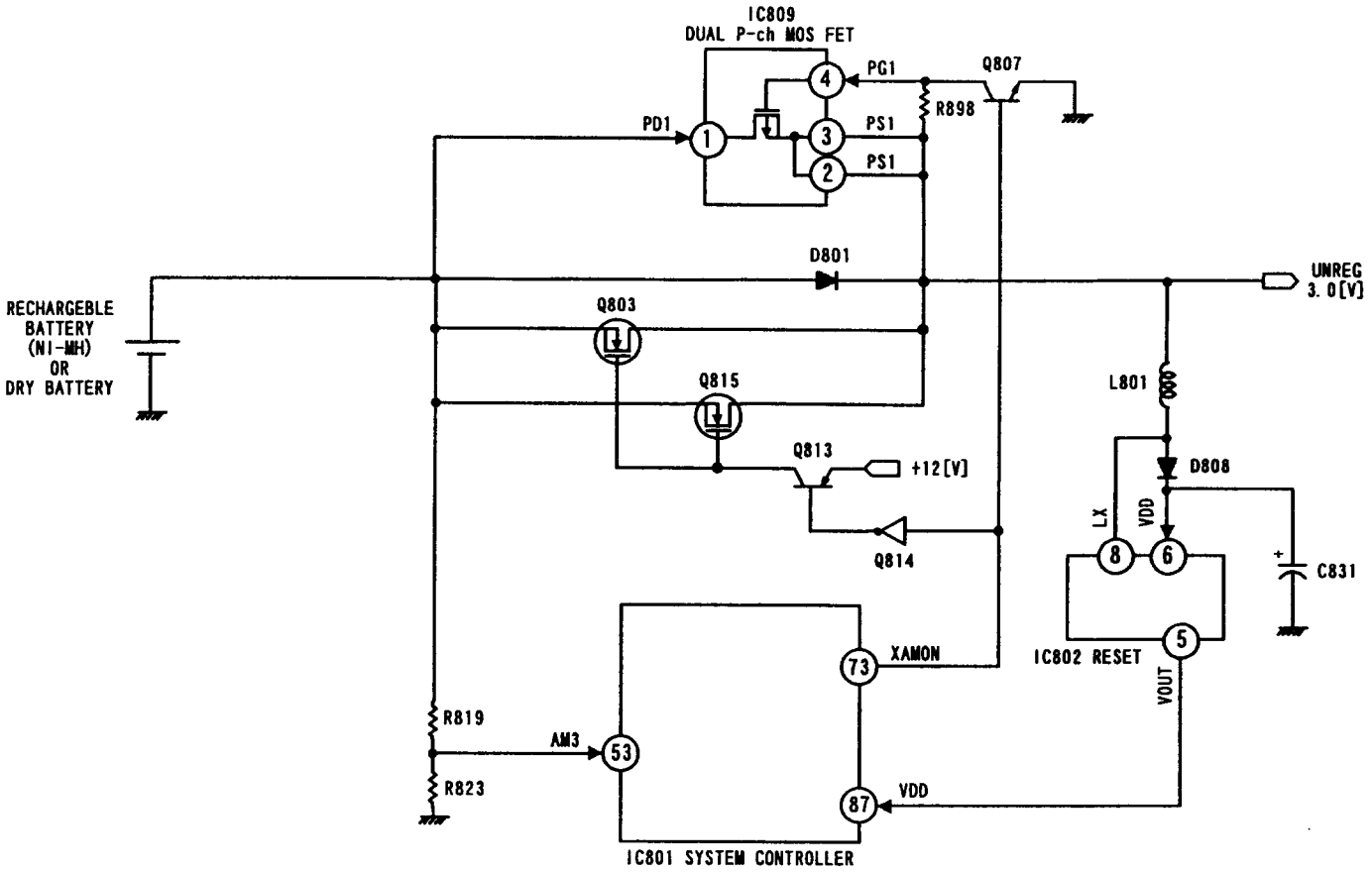


Fig. 5-9 Power Supply Circuit When Driving with External Battery

Fig. 5-9 shows the power supply circuit when driving with an external battery. When an external battery such as the rechargeable nickel hydrogen battery or a dry cell is loaded, the voltage is input to Pin ⑥ [VDD] of the RESET IC802. IC802 incorporates a VDD power supply voltage detection circuit. When the voltage input to Pin ⑥ [VDD] is lower than 3.4 [V], the voltage is maintained above 3.4 [V] by self-step up performed by the switching output of Pin ⑧ [LX], L801, D808, and C831. As a result, 2.9 [V] is output from Pin ⑤ [VOUT] of IC802, and the system controller IC801 is started.
When the system controller IC801 is started, it detects if the external battery is connected using Pin ㊸ [AM3]. When it determines that the battery is connected, it outputs "H" from Pin ㉓ [XAMON]. Q807 is turned ON by this "H" output, and the P channel FET inside the dual P-ch MOS FET IC809 is turned ON. As a result, a 3.0 [VMAX] UNREG voltage is output from Pins ② [PS1] and ③ [PS1] of IC809. At the same time, Q814 and Q813 are also turned ON by the "H" output from Pin ㉓ of the system controller IC801. Consequently, the 12[V] generated by the DC-DC converter inside the coil/motor drive IC505 is input to the Q803 and Q815 gates, and Q803 and Q815 turn ON. As a result, a stable UNREG voltage is generated by supplying a 3.0 [VMAX] UNREG voltage from the Q803 and Q815 drains.

■ Output of voltages
Voltage supply is performed in the same manner as during DC driving. For details, refer to ③ to ⑧ in **5-3. Circuit Voltage**.

5-6. Operations During Charging

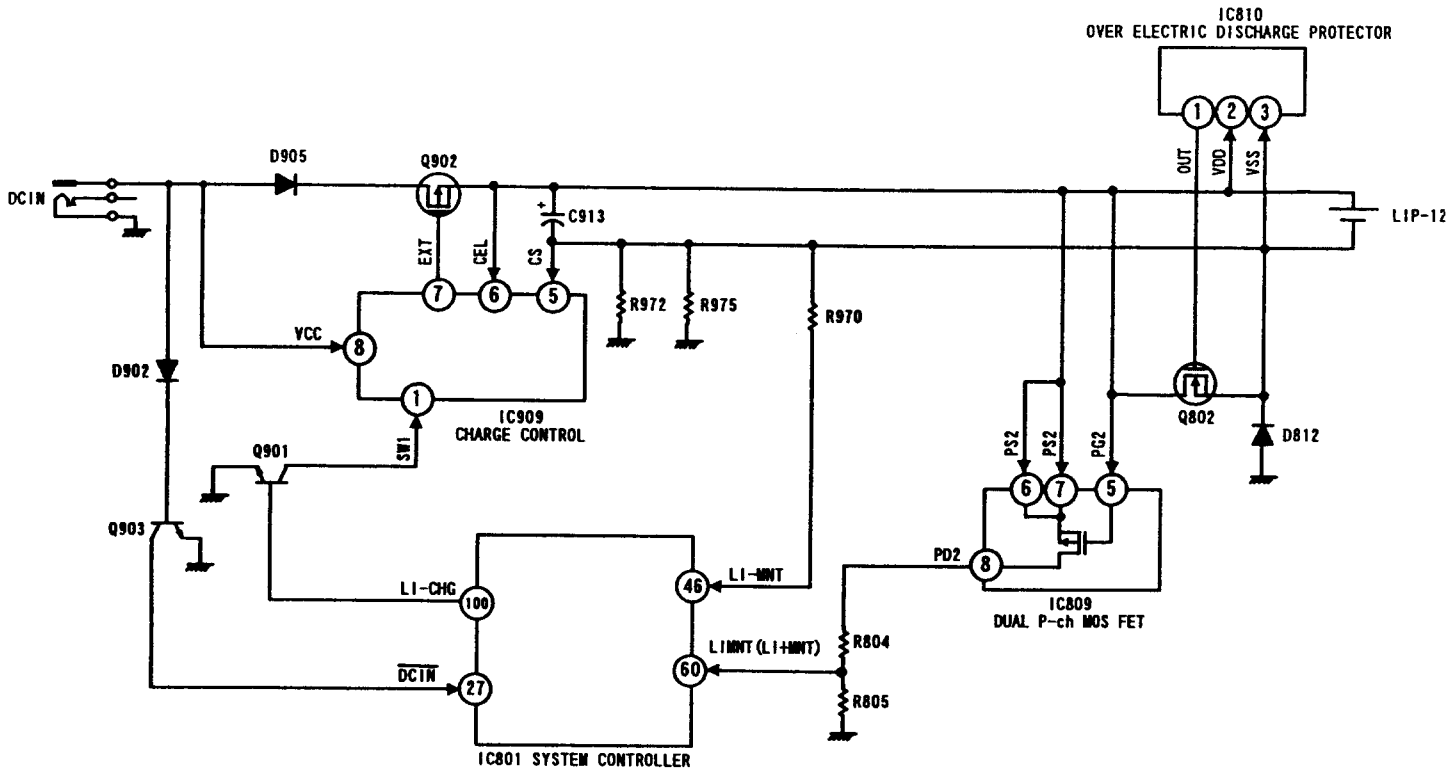


Fig. 5-10 Operations During Charging

Fig. 5-10 shows a charging circuit. When the system controller IC801 is started, it determines if the unit can be charged by first detecting if the DC plug is connected to the DC jack using Pin ㉗ [$\overline{\text{DCIN}}$]. If the DC plug is connected to the DC jack, Q903 will be ON and consequently, the input of Pin ㉗ [$\overline{\text{DCIN}}$] will be "L". Next, the system controller IC determines if the rechargeable lithium ion battery is connected, if it is, it inputs the voltage of the battery to Pin ② [VDD] of the over electric discharge protector IC810, and "H" is output from Pin ① [OUT]. The P channel FET inside the DUAL P-ch MOS FET IC809 is turned ON by this "H" output. As a result, the voltage obtained by resistance-dividing the output of Pin ⑧ [PD2] of IC809 by R804 and R805 is input to Pin ㊿ [LIMNT (LI+MNT)] of the system controller IC801. The system controller IC801 determines if the rechargeable lithium ion battery is connected according to the input of Pin ㊿ [LIMNT (LI+MNT)]. If it determines that the battery is connected during DC drive, it outputs "H" from Pin ㊿[LI-CHG]. As a result of this "H" output, Q901 turns ON, the input of Pin ① [SW1] of the charge control IC909 becomes "L", and IC909 starts.

When IC909 starts, it outputs "L" (approximately 2.8 [V]) from Pin ⑦ [EXT]. Q902 is turned ON by this "L" output, and starts rated current and rated voltage charging. IC909 detected the charge voltage (4.2 [V]) using Pin ⑥ [CEL]. It also detects current due to the drop in voltage of the external resistors (R972, R975) using Pin ⑤ [CS]. IC909 controls the output of Pin ⑦ based on these feedback values.

5-7. Reset Circuit

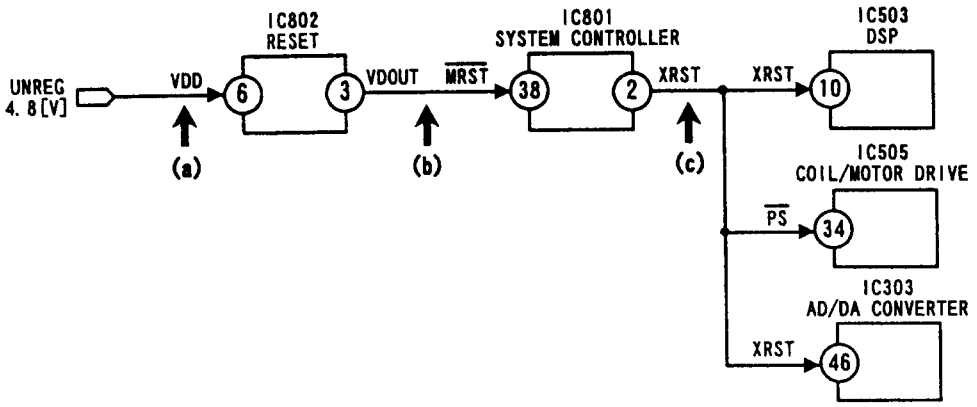


Fig. 5-11 Reset Circuit

Fig. 5-11 shows the reset circuit. As shown in the figure, when the 4.8 [V] UNREG voltage is input to Pin ⑥ [VDD] of the RESET IC802, the reset signal is output from Pin ③ [VDOUT] and input to Pin ㊳ [$\overline{\text{MRST}}$] of the system controller IC801. When a reset signal is input to the system controller IC801, it outputs the reset signal from Pin ② [XRST] to each IC (DSP IC503, coil/motor drive IC505, AD/DA converter IC303). **Fig. 5-12** shows the timing of the reset signals of (a) to (c) in **Fig. 5-11**.

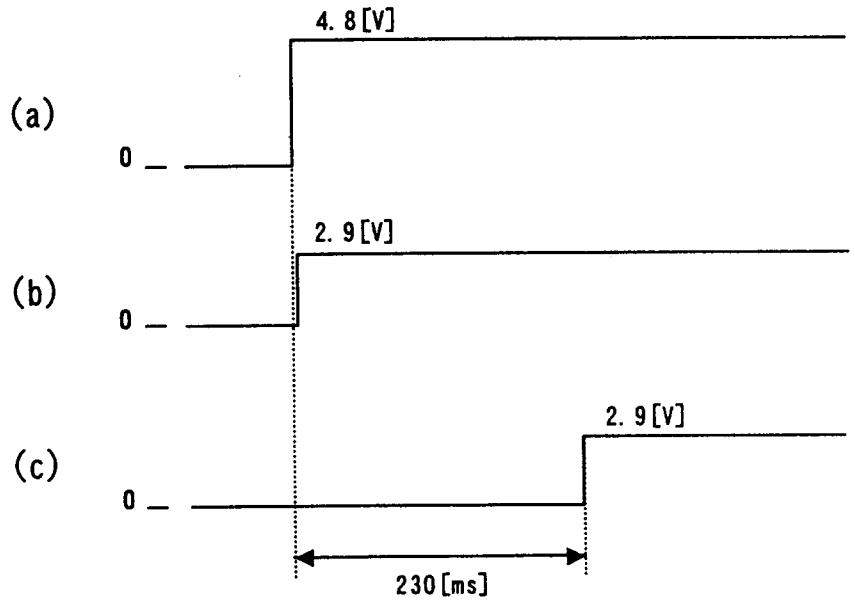


Fig. 5-12 Timing of Reset Signals

6. SIGNAL CIRCUIT

6-1. Detection Switches of Mechanism

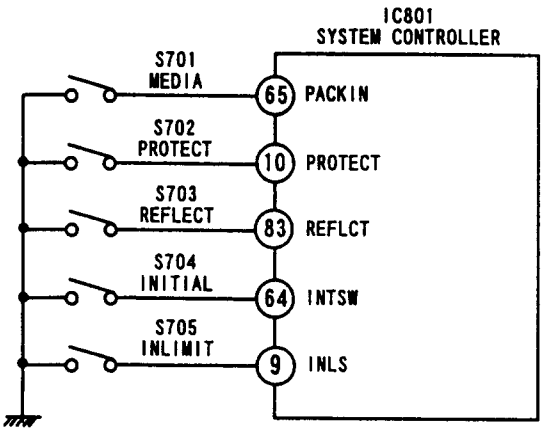


Fig. 6-1 Detection Switches of Mechanism

Fig. 6-1 shows the detection switches of the mechanism section. The mechanism has switches which determine the type of disc loaded and whether it is in the recordable state. These switches are connected to the system controller IC801. These switches perform the detection shown in **Table. 6-1**, and control the mechanism section, signal system, etc.
Table. 6-1 shows details of the detection switches of the mechanism section. In this unit, innermost circumference detection of the optical block is not performed when started (the optical block does not move to the innermost circumference). The INLIMIT SW is used only for resetting when the unit loses track of the optical block position due to shocks during playback of the disc, etc.

Table. 6-1 Detection Switches of Mechanism Section

Switch No.	Switch Name	System Controller IC Detection Terminal	Details of Detection
S701	MEDIA	Pin ⑮ [PACKIN]	Determines whether a disc is loaded (Loaded: "L", Not loaded: "H")
S702	PROTECT	Pin ⑩ [PROTECT]	Determines the rec-proof state by the PROTECT detection hole of the disc (When PROTECT : "H")
S703	REFLECT	Pin ⑬ [REFLCT]	Determines the reflectance by the MO detection hole of the disc to determine if CD or MO (When CD: "L". When MO: "H")
S704	INITIAL	Pin ⑭ [INTSW]	Detects the eject mode
S705	INLIMIT	Pin ⑨ [INLS]	Detects the completion of movement of the optical block to the innermost circumference

6-2. Operations During Recording

Fig. 6-2 shows a block diagram of the signal circuit during recording.

1. Discrimination of Input Source

The input source of the unit consists of three types-DIGITAL IN, LINE IN, and MIC IN. The LINE IN jack also serves as DIGITAL IN, and is detected by the GND of the stereo mini plug inserted. The discrimination of the input is performed by the system controller IC801 under the detection conditions shown in **Table. 6-2**. When it detects DIGITAL IN from the reason that the input of Pin ⑰ [OPTDET] is "H", and Pin ⑯ [$\overline{\text{JACKDET}}$] is "L", it outputs "H" from Pin ⑭ [OPTCONT]. Q301 and Q305 are turned ON by this "H" output, and 2.8[V] is supplied as the power supply of the optical input photo-detector.

Table 6-2. Discrimination of Input Source

	$\overline{\text{MICDET}}$ (Pin ⑱)	OPTDET (Pin ⑰)	$\overline{\text{JACKDET}}$ (Pin ⑯)
MIC IN jack detection	L	H	H
DIGITAL IN jack detection	H	H	L
LINE IN jack detection	H	L	L
Not connected	H	H	H

When several input sources are connected, they are used in the following priority order.

1. DIGITAL IN
2. MIC IN
3. LINE IN

2. AD/DA converter IC303

The audio signal input from MIC IN is input to Pins ㊹ [LIN1], and Pin ㊸ [RIN1] of the AD/DA converter IC303 via the MIC amplifier IC302. The audio signal input from LINE IN is input to Pins ㊶ [LIN2] and ㊵ [RIN2] of IC303. In the AD/DA converter IC303, the internal multiplexer is switched according to the serial command (input source selection command, etc.) from Pin ㊾ [SDO2] of the system controller IC801. Next, IC303 converts the selected audio signal into 16-bit digital data using the internal AD converter, synchronizes them with the LRCK (L-ch/R-ch discrimination signal) and BCK (bit clock) input from the DSP IC503, and outputs them to ATRAC encoder section of the CXD2652R (IC503) for L-ch and R-ch alternately.

3. DSP IC503 (Sampling rate converter)

As the DSP IC503 incorporates a sampling rate converter (referred to as SRC below), it is able to deal with digital data input from DIGITAL IN at three frequencies –32 [kHz], 44.1 [kHz], and 48 [kHz]. The digital data input from Pin ㉑ [DIN] of IC503 is input to the SRC inside IC503, and converted to 44.1 [kHz] digital data.

4. DSP IC503

The DSP IC503 switches whether to input signals from the AD/DA converter IC303 or input them from DIGITAL IN according to the serial command from Pin ⑱ [SDO1] of IC801. The selected input data is compressed to approximately 1/5 by the ATRAC encoder, synchronized with the transmission clock for every sound frame according to the data fetch command from the system controller IC801, output, and written in the 4 Mbit DRAM IC509. In the RAM controller, the compressed data stored in the DRAM is added with headers, sync patterns, etc. by the internal CD-ROM encoder and converted to the MD format.

Next, the data converted to the MD format is input to the ACIRC encoder and EFM modulator at the same timing as the "H" period of the write data transmission enable signal input to Pin ⑮ [TX] of the DSP IC503, where interleaving and EFM modulation are performed inside. The EFM modulated data is then transmitted from Pin ⑯[EFMO] of IC503 to Pin ⑭ [EFM] of the REC DRIVE IC506.

5. REC DRIVE IC506

The EFM signal input to the REC DRIVE IC506 synchronizes with the period where the output of Pin ㉞ [MODE1] of the system controller IC801 is "H" and the output of Pin ㉝ [MODE2] is "L", output from Pins ⑪ [HA] and ⑩ [HB], and recorded on the disc from the recording head every cluster. At this time, the laser power is used as the recording (write) power only during the "H" period of the laser power switching signal output from Pin ③ [WRPWR) of the system controller IC801. (Refer to the waveform timing during recording in the figure).

Table. 6-3 shows the timing during recording.

Table. 6-3 Timing during Recording

MODE1	MODE2	EFM signal	HA	HB
H	L	L	L	H
H	L	H	H	L

6. SHOCK Detection

When the unit is subject to external vibrations during recording, the laser beam may jump from the track being recorded, and accidentally erase the groove area signals already recorded. The DSP IC503 thus performs internal shock detection here.

During the WRITE power period in recording, when track jump of **more than 1.5 tracks** is detected, the DSP IC503 automatically switches the laser power from the WRITE power to the READ power. It also outputs the track jump detection signal to Pin ⑦ [XSHOCK] of the system controller IC801 from Pin ② [MNT1]. As a result, the system controller IC801 is able to detect if the music data has been written correctly, and set the command to the rewrite mode.

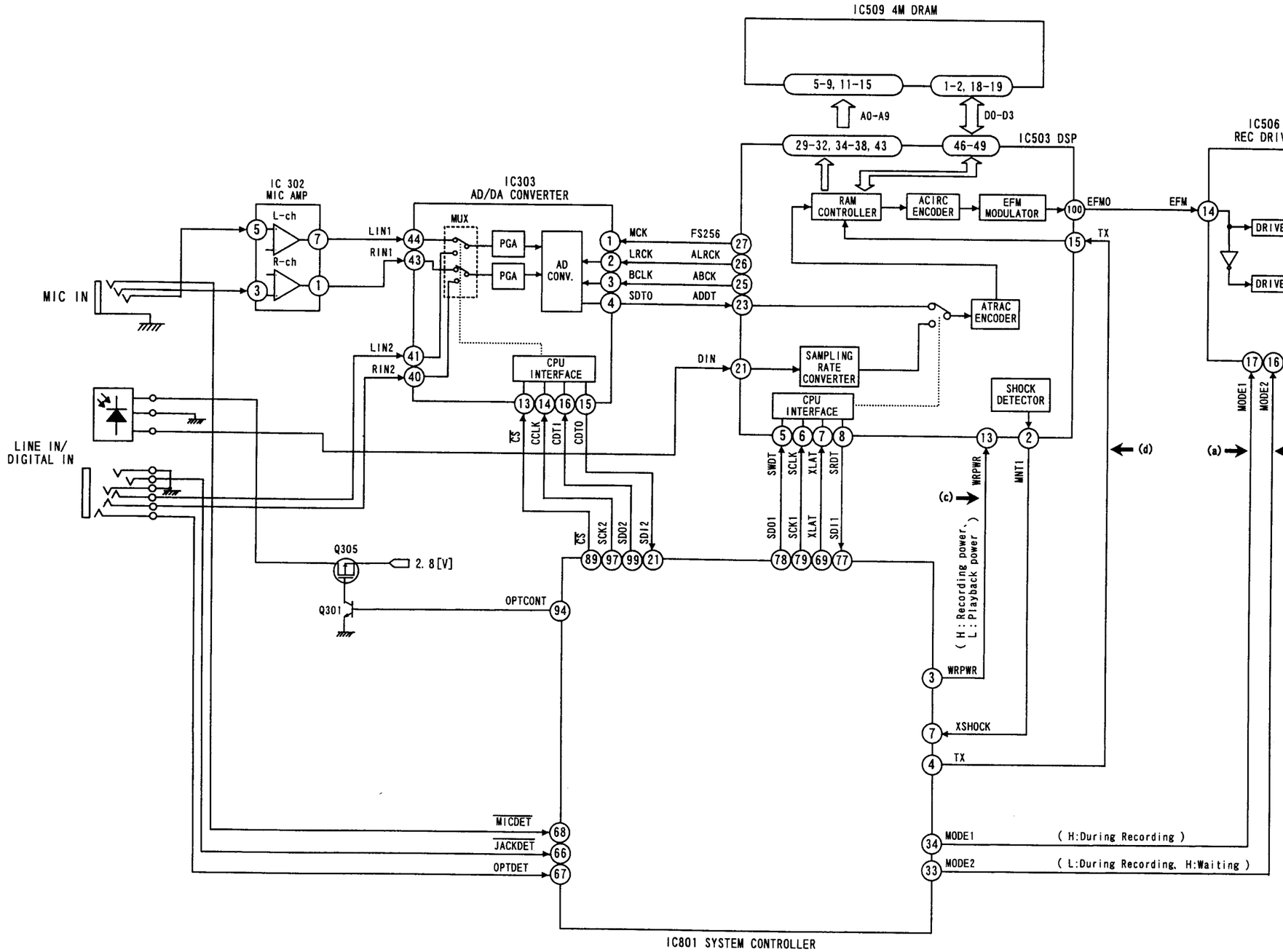
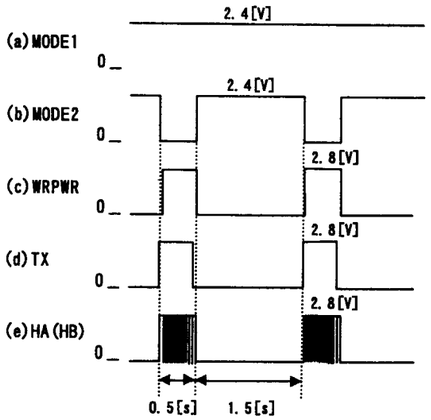


Fig. 6-2 Block Diagram of the Signal Circuit during Recording



Waveform Timing during Recording

7. Monitor output

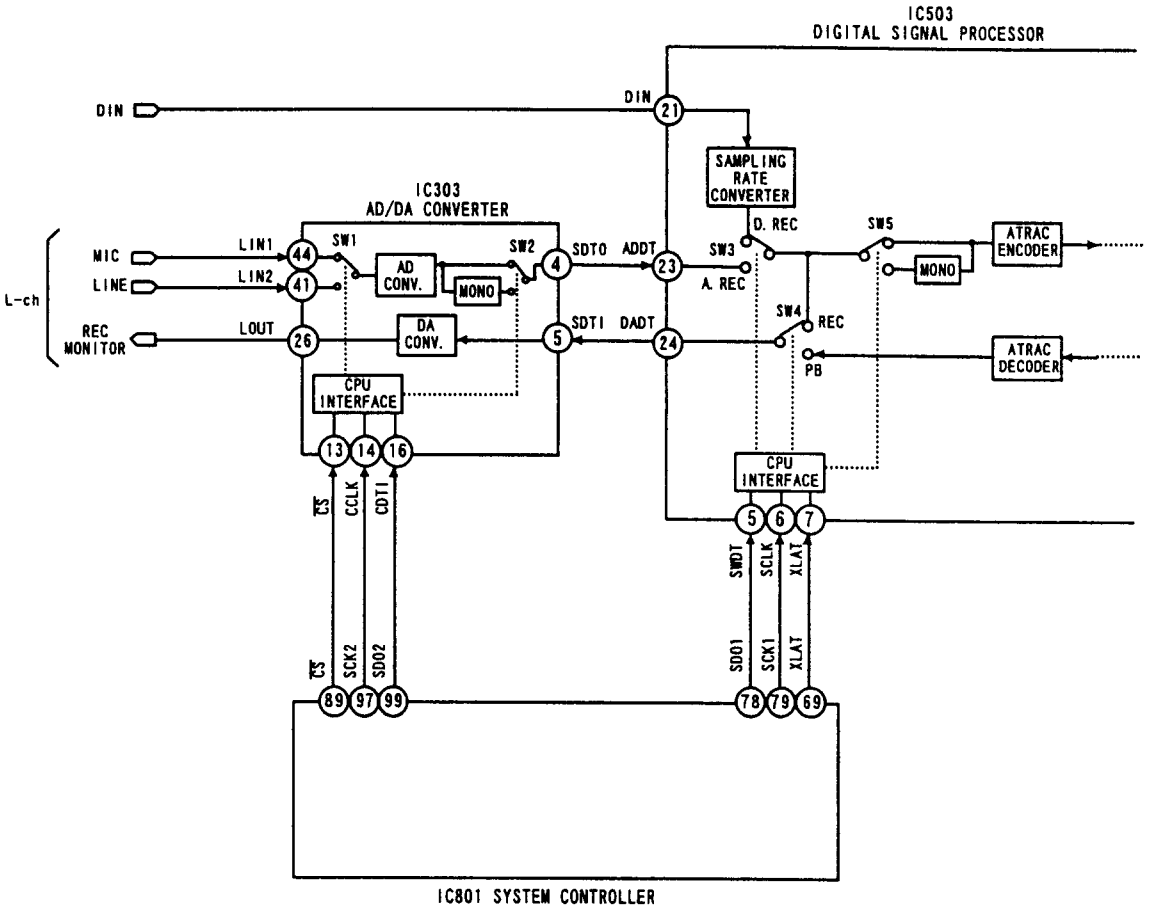


Fig. 6-3 Monitor Output During Recording

Fig. 6-3 shows a block diagram of the monitor sounds during recording.
During analog recording, the input sound source (MIC or LINE) is switched by SW1 and the recording conditions (stereo or monaural) by SW2 according to the serial commands from Pin ⑨⑨ [SDO2] of IC801. According to the serial commands from Pin ⑦⑧ [SDO1] of the system controller IC801, SW3 is connected to the A. REC side, SW4 to the REC side, and SW5 to the stereo side inside IC503. During stereo recording using the analog input, the monitor output becomes stereo, and during monaural recording using the analog input, the monitor output becomes monaural (L-ch + R-ch/2).
During digital recording, SW3 is connected to the D.REC side and SW4 to the REC side inside IC503 by the serial commands from Pin ⑦⑧ [SDO1] of the system controller IC801. At the same time, the recording conditions (stereo or monaural) are switched by SW5.
Consequently, during digital recording, the monitor output will be stereo regardless of whether the recording mode is stereo or monaural.

Table. 6-4 shows the connection of the internal SWs during recording.

Table. 6-4 Connection of Internal Switches During Recording

	SW1	SW2	SW3	SW4	SW5	Monitor output
ANALOG recording (Stereo)	MIC/LINE	STEREO	A. REC	REC	STEREO	STEREO
ANALOG recording (Monaural)	MIC/LINE	MONAURAL	A. REC	REC	STEREO	MONAURAL
DIGITAL recording (Stereo)	———	———	D. REC	REC	STEREO	STEREO
DIGITAL recording (Monaural)	———	———	D. REC	REC	MONAUAL	STEREO

6-3. Operations During Playback

Fig. 6-4 shows a block diagram of the signal circuit during playback.

1. RF amplifier IC501

The two RF signals (I and J signals) I-V converted inside the optical block are input to Pin ① [I] and Pin ② [J] of the RF amplifier IC501. Inside the RF amplifier IC501, the internal circuits are switched according to the disc mode by the serial data sent from Pin ⑫ [DTRF] of the DSP IC503. First, the system controller IC801 detects the reflectance detection hole on the disc cartridge using the REFLECT switch at the mechanism using the input of Pin ⑬ [REFLCT]. Then it outputs the CD/MO discrimination data from Pin ⑱ [SDO1] to the DSP IC503 in serial data. When the DSP IC503 receives the CD/MO discrimination data, controls the gain of the RF amplifier corresponding to the data using the serial data output from Pin ⑫ [DTRF]. In the RF amplifier IC501, the amplifier gain is switched according to the serial data sent from the DSP IC503, and the TOC recorded in pits is read. Next, the system controller IC801 switches the RF output corresponding to the information on the disc type written in the TOC using serial data. In the case of discs (CD) for playback only, the sum signal of I and J is output to the AGC circuit. In the case of the groove area (UTOC, program area) of the MO disc, the difference signal of I and J is output to the AGC circuit. The EFM signal which passes through the AGC circuit and EQ (equalizer) circuit is output from Pin ㊳ [RF] of IC501 to Pin ㊺ [RFI] of the DSP IC503 at an amplitude of approximately 1.0 to 1.2 [Vp-p].

2. DSP IC503

In the DSP IC503, after the extraction and creation of the clock from the EFM signal input using the internal EFM digital PLL circuit, EFM demodulation, and de-interleaving is performed in the ACIRC decoder circuit. Next, the de-interleaved data is written in the DRAM IC509 via the RAM controller circuit. The data accumulated in the DRAM is output to the ATRAC decoder circuit according to the data transfer command from the system controller IC801. The expansion of the data compressed to 1/5 in the ATRAC decoder circuit is then performed, and data continuing for L-ch and R-ch alternately synchronizes with the L-ch and R-ch discrimination signal of Pin ㉖ [ALACK] and bit clock of Pin ㉕ [ABCK], and output to the AD/DA converter IC303 from Pin ㉔ [DADT].

3. AD/DA converter IC303

The audio data input to the AD/DA converter IC303 is converted from Digital to Analog after filter calculation of the signal by the digital filter inside IC303. After this, the L-ch signal is output from Pin ㉖ [LOUT] and the R-ch signal from Pin ㉕ [ROUT].

When Pin ㉓ [D.B.B.] acknowledges that the DBB key has been pressed, the system controller IC801 outputs the serial command from Pin ㊾ [SDO1] to control the DBB circuit modes (OFF/BASS1/BASS2) of the DBB circuit inside IC303.

4. Line buffer IC304/audio gain control IC352/head phone amplifier IC805

The audio signal output from the AD/DA converter IC303 is output via the buffer IC304, audio gain control IC352, and head phone amplifier IC805. In IC352, the volume of the headphone output is adjusted by the serial data from Pin ⑰ [SDIO2] of the system controller IC801.

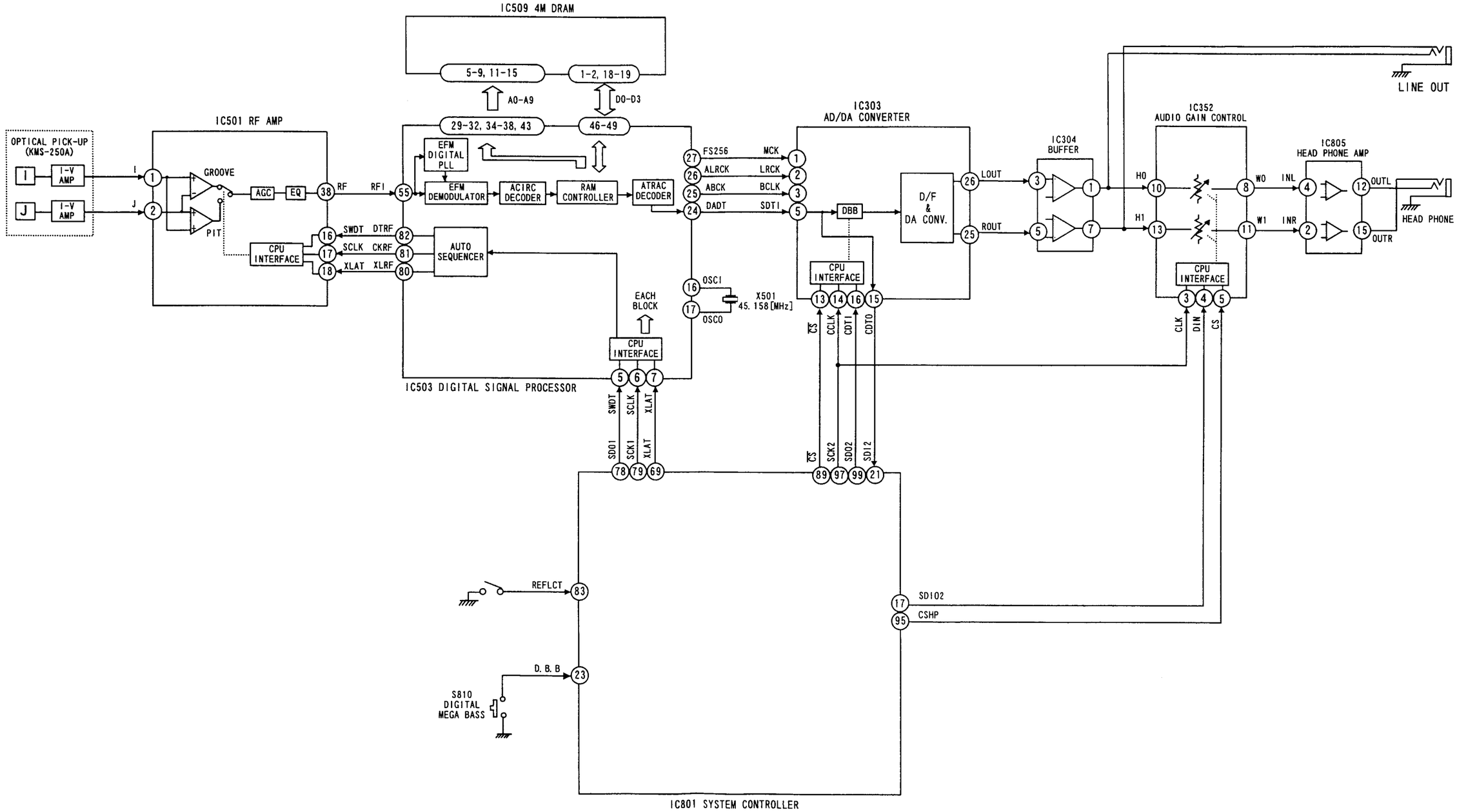


Fig. 6-4 Block Diagram of the Signal Circuit during Playback

6-4. BEEP Generation Circuit

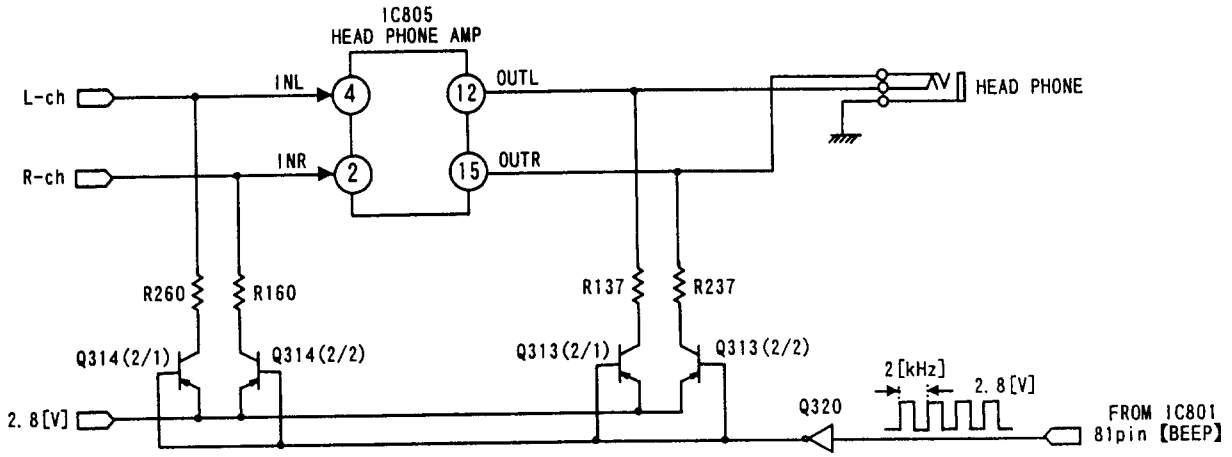


Fig. 6-5 BEEP Generation Circuit

Fig. 6-5 shows the BEEP generation circuit.
When the system controller IC801 detects signals from the remote controller using the input of Pin ㊾ [KEY2], it outputs the 2 kHz BEEP control signal (refer to the square wave) from Pin ㊽ [BEEP]. Q320, Q313, and Q314 perform switching operations according to this output, and as a result, the BEEP is output to the head phone.

Fig. 6-6 shows the output of Pin ㊽ [BEEP] of the system controller IC801 during pause of the unit.

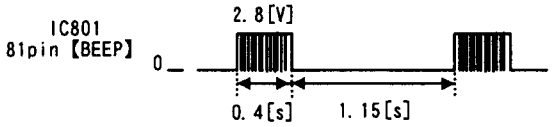


Fig. 6-6 BEEP Output (During Pause)

6-5. PLL Circuit and Clock System

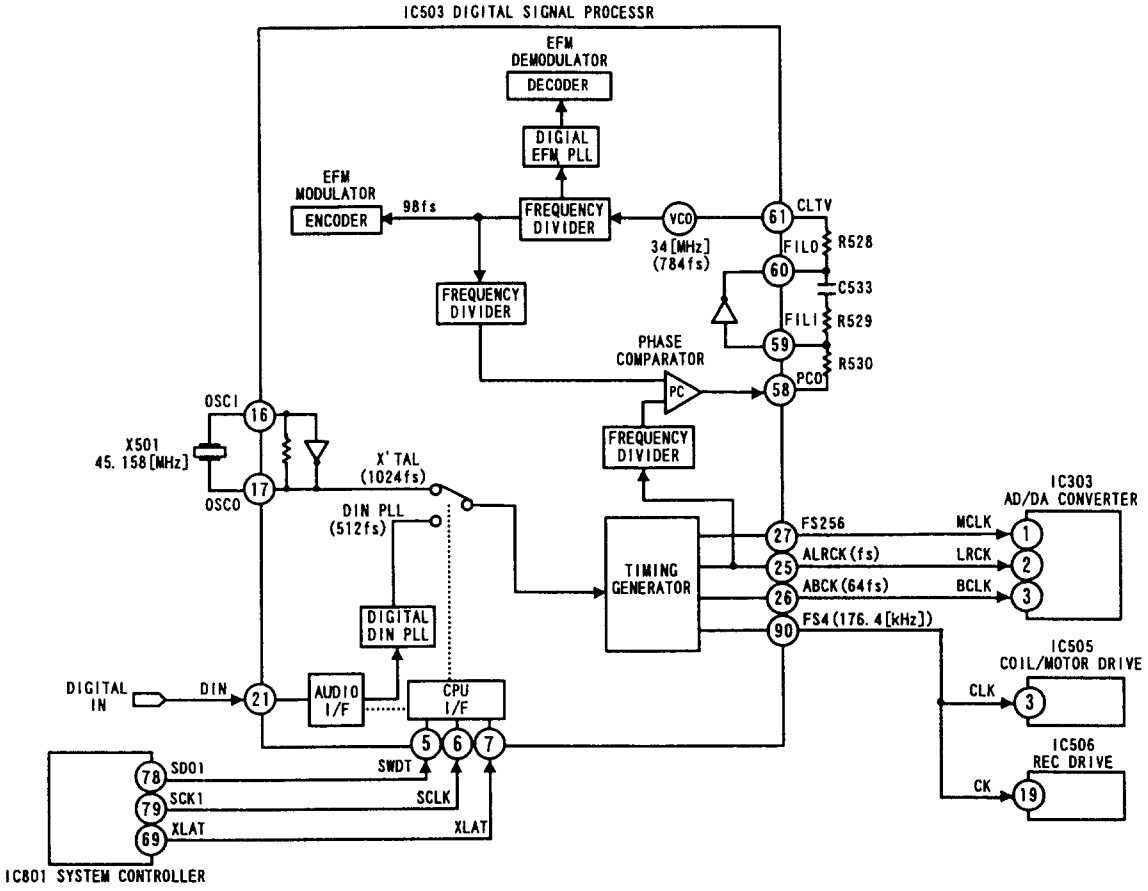


Fig. 6-7 PLL Circuit and Clock System

Fig. 6-7 shows the block diagram of the PLL circuit and clock system. The DSP IC503 is provided with such functions as digital signal processing, digital servo signal processing, EFM and ACIRC encoder/decoder function, encoder PLL, decoder PLL, and digital IN PLL. **Table. 6-5** shows the operation mode of the PLL circuit. As shown in the table, the reference oscillation is switched to the 512 fs (fs=44.1 kHz) of the digital IN PLL inside or 1024 fs of X501 according to the operation mode. This switching of the reference oscillation is performed according to the serial data from Pin ⑱ [SDO1] of the system controller IC801. Using this serial data, the EFM and ACIRC encoder and decoder are switched according to the recording/ playback mode.

In the case of the digital recording, by locking the 512 fs of the digital IN PLL to the sync signal contained in the input signal from the other party equipment connected (CD, etc.), the ALRCK and ABCK from the timing generator inside are generated. At the same time, the master clock (256 fs) supplied to the AD/DA converter IC303 is also generated. Based on the ALRCK (fs: 44.1 [kHz]) generated by the timing generator, the 784 fs VCO encoding PLL is operated, and the 98 fs [4.321 [kHz]) obtained by dividing this is EFM- modulated as the channel clock.

Table. 6-5 Operation Modes of PLL Circuit

MODE	Reference Oscillator	Operation PLL	Purpose
Analog recording	X501 : 1024 fs	Encoder PLL	Generation of channel clock for EFM modulation
Digital recording	Digital IN PLL : 512 fs	Digital IN PLL → Encoder PLL	Generation of channel clock for EFM modulation
Playback	X501 : 1024 fs	Decoder digital PLL	Generation of channel clock for EFM demodulation

7. SERVO CIRCUIT

7-1. Outline of Servo Circuit

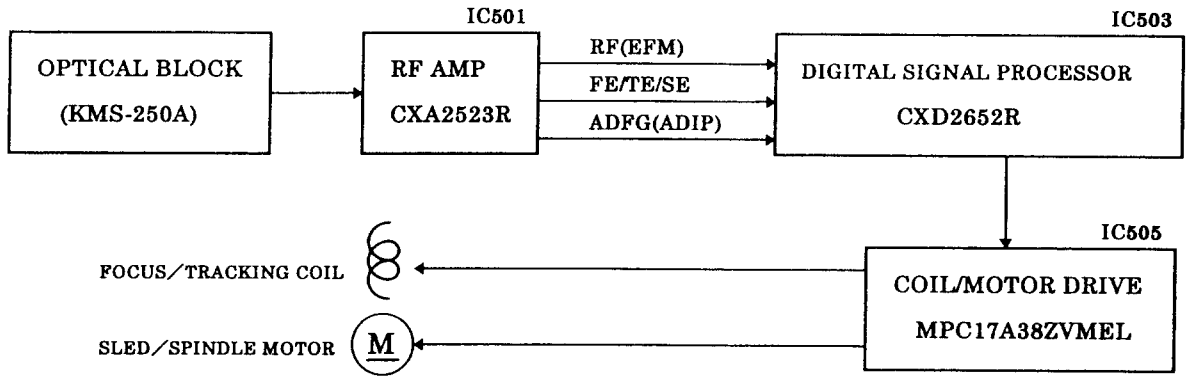


Fig. 7-1 Block Diagram of Servo Circuit

As shown in **Fig. 7-1** the servo circuit is composed of the RF amplifier IC501, DSP IC503, and coil/motor drive IC505, etc. When a playback only disc (CD) is used, the servo will have more or less the same structure as that of the CD player. In the focus, tracking, and sled servos function, the error signals output from the RF amplifier IC501 are performed servo calculation inside the DSP IC503, are output the results in PWM wave, and are driven the coil and motor via the coil/motor drive IC505. In the spindle servo, the clock inside the EFM signal is extracted by the digital PLL inside the DSP IC503, is performed servo calculation, and is driven the spindle motor via the coil/motor drive IC505.
When the MO disc is used, only the spindle servo circuit differs from that when the playback disc (CD) is used. This is because when recording on an unrecorded MO disc, EFM signals cannot be used. Therefore, the clock of the ADIP signal recorded in the groove area is extracted by the DSP IC503, and the servo circuit is controlled using this clock via the coil/motor drive IC505.

In this unit, the focus/tracking coil and sled/spindle motor are controlled by the digital servo composed of the RF amplifier IC501, DSP IC503, and system controller IC801. As a result, the offset adjustment, focus/tracking gain adjustment, and E-F balance adjustment are automatically performed by the digital servo so that the optimum values corresponding to the disc type are obtained. At the same time, optimization of the servo is performed by transmitting to the servo circuit the data on the adjusted focus bias stored in the nonvolatile memory (NV RAM IC807).

7-2. Focus Servo Circuit

Fig. 7-2 shows the focus servo circuit.

1. Focus Bias Adjustment

In this unit, focus bias adjustment is performed during the general adjustment mode, and the focus bias value is stored in the NV RAM IC807. During the adjustment, the sum signal of I and J (CD) or the difference signal (MO) is output from the RF amplifier. At the same time, 3T frequency components are extracted by the 3T band pass filter. Next, the 3T component signal peak-detected in the PEAK circuit is output to the DSP IC503 from Pin ㉝ [AUX] of IC501. In the DSP IC503, the input 3T component signal is converted to digital data by the A/D block inside IC503, and output to Pin ㊼ [SDI1] of the system controller IC801 from Pin ⑧ [SRDT]. When the system controller IC801 receives the 3T component data, it calculates the optimum focus bias value based on this data, and stores in the NV RAM IC807.

2. Operations of Focus Servo

As shown in **Fig. 7-2**, the output from the A to D detectors of the optical block is input to the RF amplifier IC501, and the ABCD signal and focus error signal output via ABCD amplifier and F.E. (focus error) amplifier are output to the DSP IC503 from Pin ㉟ [ABCD] and Pin ㉞ [FE] respectively. The A to D I-V amplifier inputs inside the RF amplifier IC501 has gain SWs for adjusting level. Using the serial commands output from Pin ㊷ [RFDT] of the DSP IC503, initial settings of the gain are performed according to the disc type as well as gain adjustment for every disc to obtain the optimum output. The DSP IC503 converts the ABCD level data input to Pin ㊹ [ABCD] to the digital data by the internal A/D block. The converted data is read, and the gain SW is controlled so that the ABCD level becomes the specified level. The ABCD signal is input to the FOK detection circuit, and the FOK signal obtained by comparing with the slice level set beforehand is output from Pin ⑨ [SENS] to the system controller IC801. As a result, the system controller IC801 acknowledges that focus search has completed. The focus error signal selected by the analog multiplexer inside the DSP IC503 is converted to the 8-bit digital value by the A/D block. Next in the digital servo process, the focus bias value sent from Pin ㊽ [SDO1] of the system controller IC801 is added as bias value to the focus error signal input, servo calculation is performed, converted to the 176 [kHz] PWM wave, and output. The output focus servo signal controls the focus coil via the coil/motor drive IC505.

In this unit, during battery driving, laser is emitted or stopped during recording and playback to save power (the laser is continuously emitted during DC driving). For this reason, as the focus is turned ON immediately when the laser is emitted, the focus coil drive voltage output from the coil/motor drive IC505 is output to Pin ㊼ [FDMON] of the system controller IC801 via the buffer IC508. The system controller IC801 stores the average value of the data input to Pin ㊼ in the internal memory at a certain cycle, and based on these values, carries out focus search while the laser is emitted.

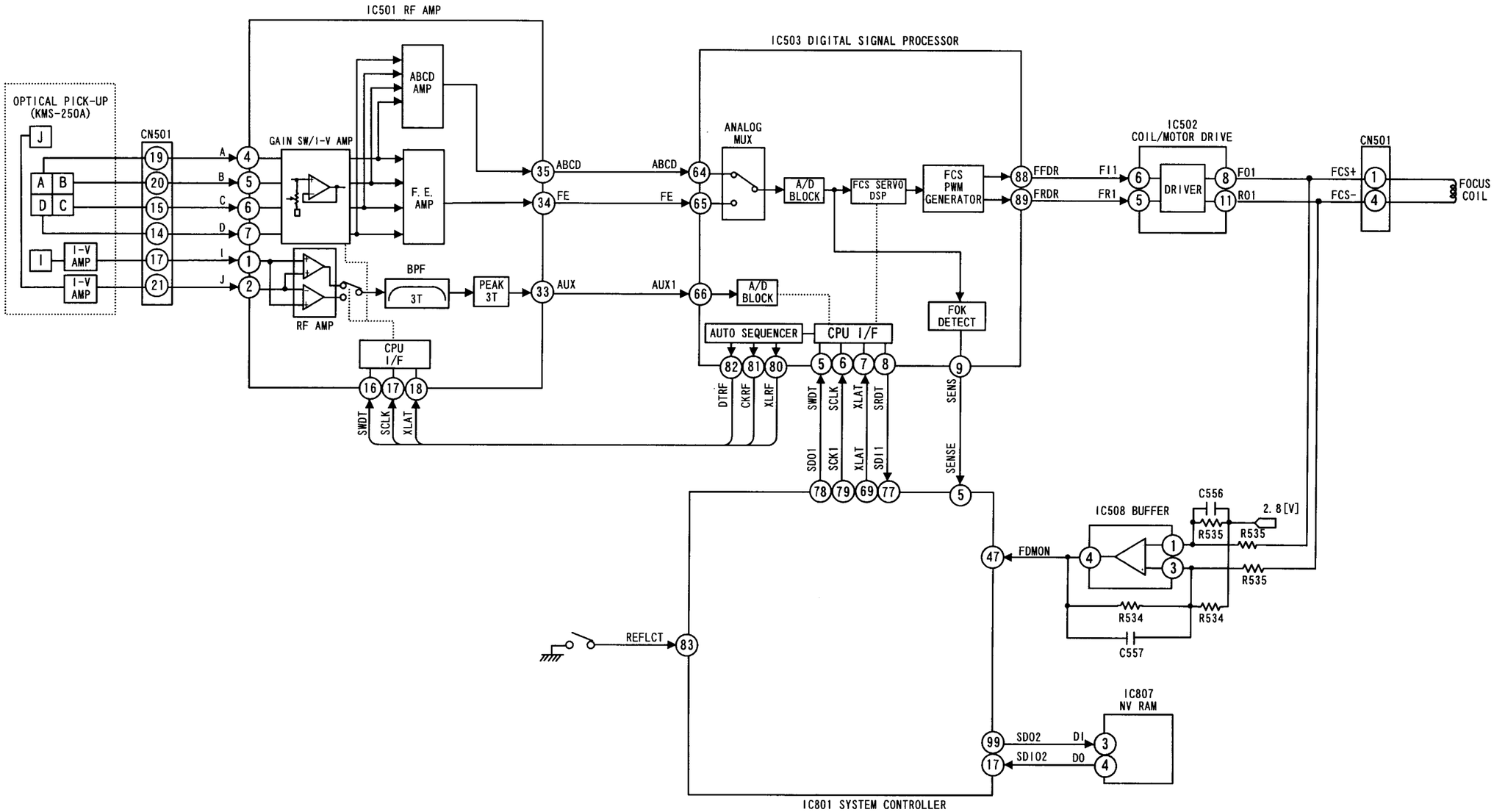


Fig. 7-2 Focus Servo Circuit

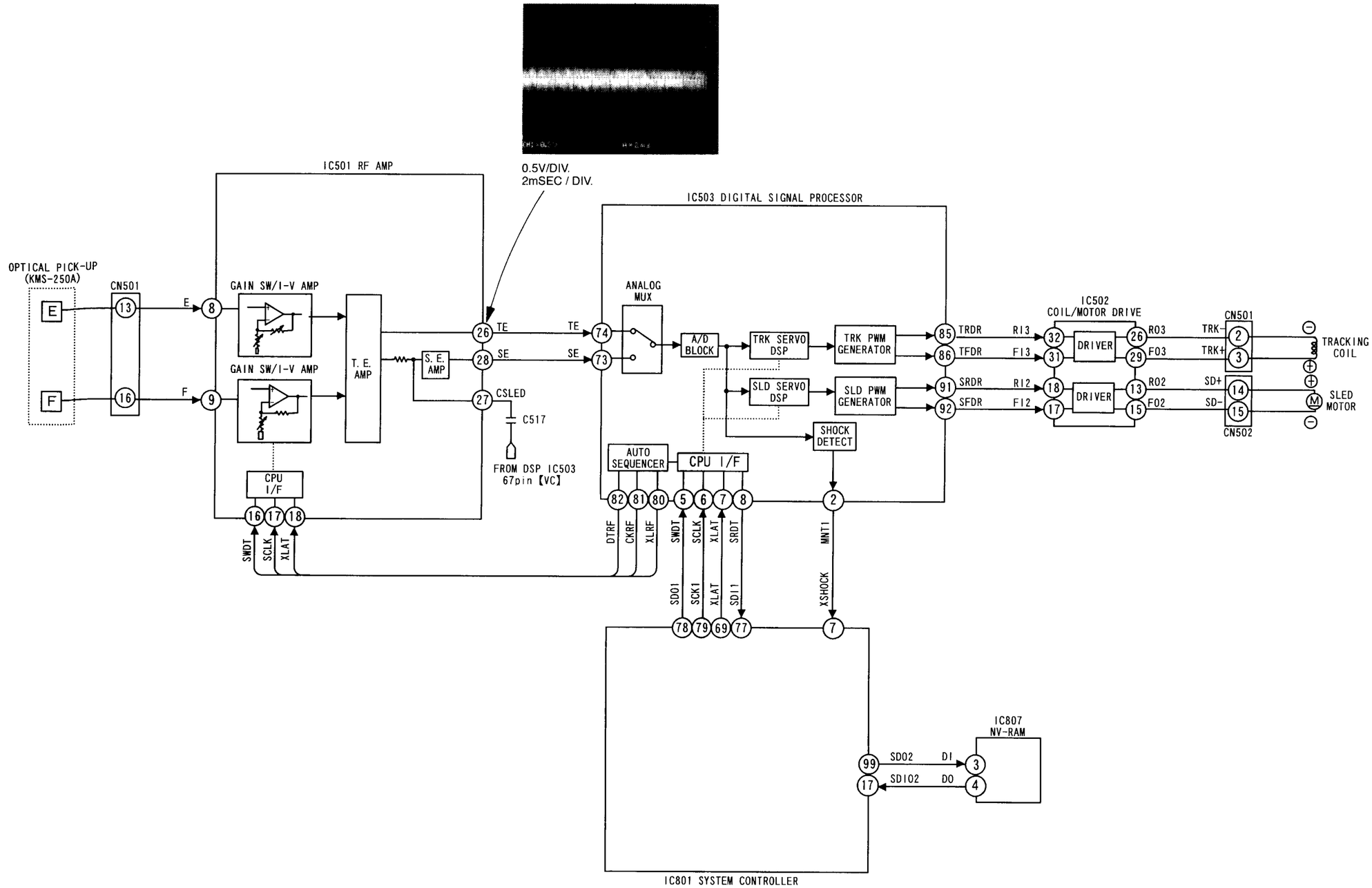


Fig. 7-3 Tracking/Sled Servo Circuit

7-3. Tracking/Sled Servo Circuit

As shown in **Fig. 7-3**, the output from the E and F detectors of the optical block is input to Pin ⑧ [E] and Pin ⑨ [F] of the RF amplifier IC501. Inside the IC501 input, like the A to D I-V amplifier of the focus servo circuit, gain SW for level adjustment is provided. These are linked and adjusted to obtain the optimum output using the serial command from Pin ㉜ [DTRF] of the DSP IC503. The feedback section of the I-V amplifier of E has a balance switch. By fixing the feedback section of the I-V amplifier of F, E-F balance adjustment is performed. Adjustment of this balance switch is also performed by the DSP IC503.

In the T.E. (tracking error) amplifier inside the RF amplifier IC501, switching of the internal circuit is performed by the command from the system controller IC801. In the case of pit, the tracking error signal of -(E-F) is output from Pin ㉖ [TE], and the (E-F) tracking error signal in the case of groove. On the other hand, the sled signal output from Pin ㉘ [SE] after integrating the tracking error signal using the resistor inside IC501 and C517 connected to Pin ㉗ [CSLED].

The error signals input to the DSP IC503 are switched by the analog multiplexer inside IC503, and converted to 8-bit digital values by the A/D block. After servo calculation by the respective DSP, the tracking error signal is converted to the 88 kHz PWM wave and the sled error signal to the 44 kHz PWM wave, and the tracking coil and sled motor are controlled via the coil/motor drive IC505.

During tracking gain adjustment, gain is automatically adjusted to the optimum value for each disc inside the DSP IC503 according to the serial command from the system controller IC801. In adjustments of the MO traverse and CD traverse, the data (approximate value) during adjustment is stored in the NVRAM IC807 and during playback, it is transmitted to the DSP IC503 from the system controller IC801. To compensate the offset generated according to the temperature characteristics of the optical block, automatic adjustment of the E-F balance is performed every time. In this adjustment, the system controller IC801 calculates the corrected E-F balance value using the tracking offset data output by the DSP IC503, and based on this, controls the offset correction circuit inside IC503 so that the offset becomes the specified value (VC).

The DSP IC503 also has a detection function for the track jump caused by shocks. When external shocks are applied during the recording of the MO disc, the laser beam jumps from the track being recorded, and may accidentally erase the signals in the already recorded groove area. To prevent this, when track jumps of **more than 1.5 tracks** caused by shocks are detected during the WRITE power period in recording, by the track jump detection function, the DSP IC503 automatically switches the laser power from the WRITE power to READ power. In addition, it also outputs gain setting serial data for the READ power to the RF amplifier IC501 from Pin ㉜ [DTRF] and outputs the track jump detection data to Pin ⑦ [XSHOCK] of the system controller IC801. As a result, the system controller IC801 is able to recognize that the music data could not be written properly, and sets the command to the rewrite mode.

7-4. Spindle Servo Circuit

As shown in **Table. 7-1**, the spindle servo is broadly divided into the EFM-CLV and ADIP-CLV modes according to the recorded side of the disc.

In the pit of the disc for playback only (CD) and pit (PTOC) of the MO disc, like normal CD players, the EFM-CLV mode is used. In the groove area of the MO disc, the ADIP-CLV mode is used. As shown in **Table. 7-2**, the CLV mode consists of four modes from CLVS to VLVH, and the mode is switched according to the operation.

In the normal playback state, the CLVA is used. When the recorded side is the pit area, the GFS (Guarded Frame Sync) is checked. When groove, the CRC (Cyclic Redundancy Check) of the ADIP is checked, After checking them, the servo mode is automatically switched the CLVS or CLVP and the spindle motor is controlled by the selected servo mode.

Table. 7-1 Spindle Servo Mode

Disc Type	Recorded side	Servo mode
MO groove	Groove	ADIP-CLV
MO pit (PTOC)	Pit	EFM-CLV
CD pit	Pit	EFM-CLV

Table. 7-2 CLV Mode

Mode	Details		
CLVS	Rough servo for fetching		
CLVP	PLL mode		
CLVA	Auto mode	Checks GFS when EFM-CLV*7-1	"H" → CLVP, "L" → CLVS
		Checks CRC when ADIP-CLV	"OK" → CLVP, "NG" → CLVS
CLVH	Rough servo in high speed access		

*7-1. GFS becomes "H" when the frame sync played back obtained at the correct timing.

Fig. 7-4 shows the spindle servo circuit.

1. EFM-CLV

The output of the I and J detectors of the optical block is first input to the RF amplifier IC501. When the recorded side is the pit area, the sum signal of I and J is then output to the DSP IC503 from Pin ㊳ [RF] via the AGC circuit and EQ (equalizer) circuit.

2. ADIP-CLV

In the MO disc, the groove area is wobbled by the FM signal which has a 22.05 kHz carrier, so that the absolute addresses are recorded on the whole recorded side. To detect the wobbling components, the outputs of the A to D detectors are required. First, the outputs of the A, B, C, and D detectors of the optical block are input to the RF amplifier IC501. As a result, the main spot push-pull signal ((A+D)-(B+C)) is generated by the ADIP amplifier inside IC501. Next, this signal is input to the band pass filter, to eliminate the noise components. It is then output from Pin ㉜ [ADFG] as the binarized signal of the ADIP via the AGC circuit and comparator.

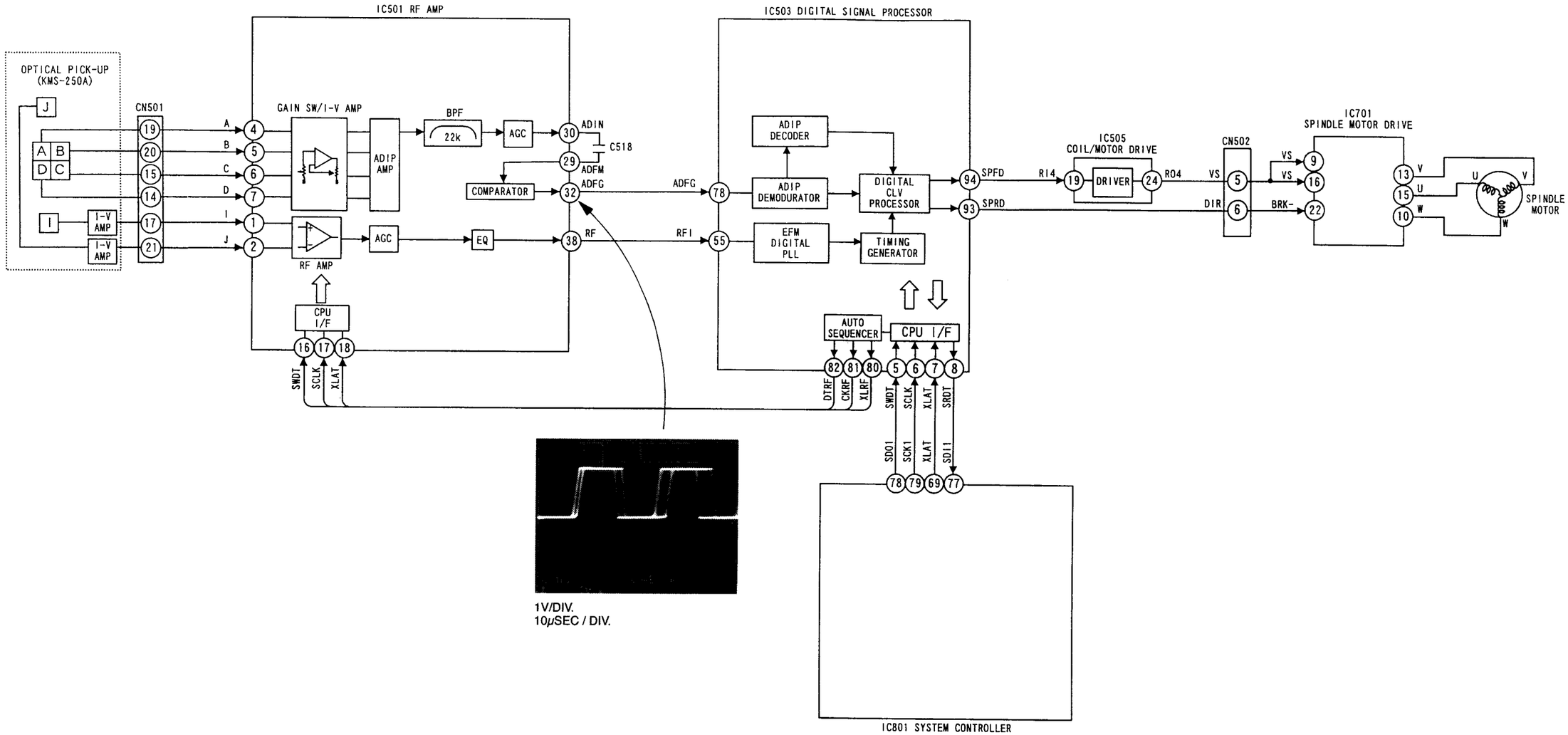


Fig. 7-4 Spindle Servo Circuit

3. DSP IC503

The DSP IC503 performs demodulation of the ADIP signal and playback of the clock. The data on the absolute addresses obtained by the ADIP decoder is output to the system controller IC801 via the SRDT line from the CPU interface. This is used for the address during access.

For the EFM signal and ADIP signal input to the DSP IC503 from the RF amplifier IC501, IC503 performs playback of the clock contained in these signals in all cases using the PLL circuit inside IC503, compares it with the reference frequency using the CLV processor, detects the spindle error, and converts it to the 44 kHz PWM wave. At the same time, it outputs the spindle error signal to the spindle motor drive IC701 from Pin ㊹ [SPFD] via the coil/motor drive IC505. It also outputs the normal direction/reverse direction signal of the motor from Pin ㊸ [SPRD] to the spindle motor drive IC701.

In the spindle motor drive IC701, based on the spindle error signal input and normal direction/reverse direction signals of the motor, the rotation of the spindle motor is controlled by the three outputs U, V, W.

8. CONTROL CIRCUIT OF APC AND LASER POWER

The APC circuit controls the laser power without being affected by the temperature characteristics of the laser diode. **Fig. 8-1** shows the block diagram of the APC and laser power control circuit. In this control, the front monitor diode inside the optical block is used as the detector of the light amount of the light path to feedback to the RF amplifier IC501.

8-1. Driving of Laser Diode

In the MD, laser output is changed according to the type of disc and whether recording or playing back. The type of disc is determined by Pin ⑬ [REFLCT] of the system controller IC801.

In the case of the READ power (during playback), the system controller IC801 outputs the laser power setting data during playback to the DSP IC503 from Pin ⑱ [SDO1] in serial data. Inside the DSP IC503, the laser power setting data for playback received is converted to the 176 [kHz] PWM by the APC PWM generator, and output from Pin ⑬ [APCREF]. The PWM wave output is waveform-shaped by IC502, converted to DC by the low pass filter composed of R511, R512, C512, and C513, and input to Pin ⑫ [APCREF] of the RF amplifier IC501.

The voltage for driving the laser diode is output from Pin ⑪ [APC] taking the APC REF (automatic LASER power control reference) input to Pin ⑫ [APCREF] of IC501 as the reference voltage to control the output current of Q502 (1/2). The R505 and R554 connected to the Q502 (1/2) emitter are used for measuring I_{OP} at the both ends during laser power adjustments, etc. When the laser diode is turned on by the collector output current of Q502 (1/2), the monitor photo diode output is input to Pin ⑩ [PD] of the RF amplifier IC501. The RF amplifier IC501 compares the value fed back from the monitor photo diode and the APC reference voltage, and controls the output of Pin ⑪ [APC] so that the laser power becomes constant.

When recording on the MO disc, the optimum recording power is defined from 2.5 [mW] to 5 [mW] and written on the disc. This optimum recording power of each disc is output to the system controller IC801 from the Pin ⑧ [SRDT] of the DSP IC503. Based on this data, the system controller IC801 compensates the recording power to be described later, and outputs the recording power setting data from Pin ⑱ [SDO1] to the DSP IC503 in serial data like during playback. It then synchronizes with the "H" timing of the laser power switching signal ("H": WRITE, "L": READ) output from Pin ③ [WRPWR] of the system controller IC801 and outputs a PWM wave equivalent to the recording power from Pin ⑬ [APCREF] to control Q502 like during playback.

8-2. Compensation of Recording Power

During recording, laser power compensation is performed due to the changes in the recording power of the disc caused by the surrounding temperature and internal temperature of the unit. These changes are detected utilizing the changes in the temperature characteristics of the temp meter IC803. The compensation process is described below.

1. The system controller IC801 outputs serial data from Pin ⑱ [SDO1], and reads the optimum recording power of each disc from Pin ⑧ [SRDT] of the DSP IC503.

2. The system controller IC801 calculates the optimum recording power in the external temperature based on the optimum recording power of the disc read and the external temperature (internal temperature of the unit) which is read by the temp meter IC803 and input to Pin ⑭ [TEMP], and outputs the value to the DSP IC503 from Pin ⑱ [SDO1] in serial data.

3. The DSP IC503 converts this value to a PWM wave using the APC PWM generator inside based on the compensated data, synchronizes it with the "H" timing of the WRPWR signal, and outputs it from Pin ⑬ [APCREF].

4. During recording, this compensation is carried out once every few seconds to deal with the rise in the internal temperature of the unit.

8-3. High Frequency Superimpose Circuit

The optical block incorporates a H.F.MOD (approximate 550 MHz) high frequency module. During the READ power, this circuit switches the level of the high frequency superimpose signal with the 2.8 V synchronized with the "L" timing of the laser modulation switching signal from Pin ⑱ [XMODON] of the system controller IC801. During the WRITE power, it switches with the 2.1V generated by IC504 which synchronizes with the "H" timing of the laser power switching signal from Pin ③ [WRPWR] of the system controller IC801. It then superimposes the high frequency with the drive voltage of the laser diode to avoid the effects of the scoop noise.
This high frequency superimpose circuit drives the high frequency module with 2.1 V during the WRITE power and with 2.8V during the READ power due to the rated voltage of the laser diode.

8-4. Prevention of Overvoltage

When the voltage when the unit is being started using the WRITE power is unstable, the laser diode of the optical block may damage if a large voltage is supplied to it. To prevent this, the BATT DET IC510 is used to detect the voltage for the optical block. When the 2.8 V voltage for the optical block input to Pin ③ of IC510 rises above 3.0V, the N channel FET turns OFF, and Pin ① sets to the "H" potential. As a result, Q503 turns ON, and the PWM wave output from Pin ⑬ [APCREF] of the DSP IC503 and the FE signal output from Pin ⑭ [FE] of the RF amplifier IC501 are muted to prevent overvoltage from being supplied to the laser diode. When input of the FE signal is stopped, the DSP IC503 outputs this information to the system controller IC801 from Pin ⑧ [SRDT]. When the system controller IC801 receives the signal, it acknowledges that an overvoltage has been supplied to the unit, and sets the rewrite mode.

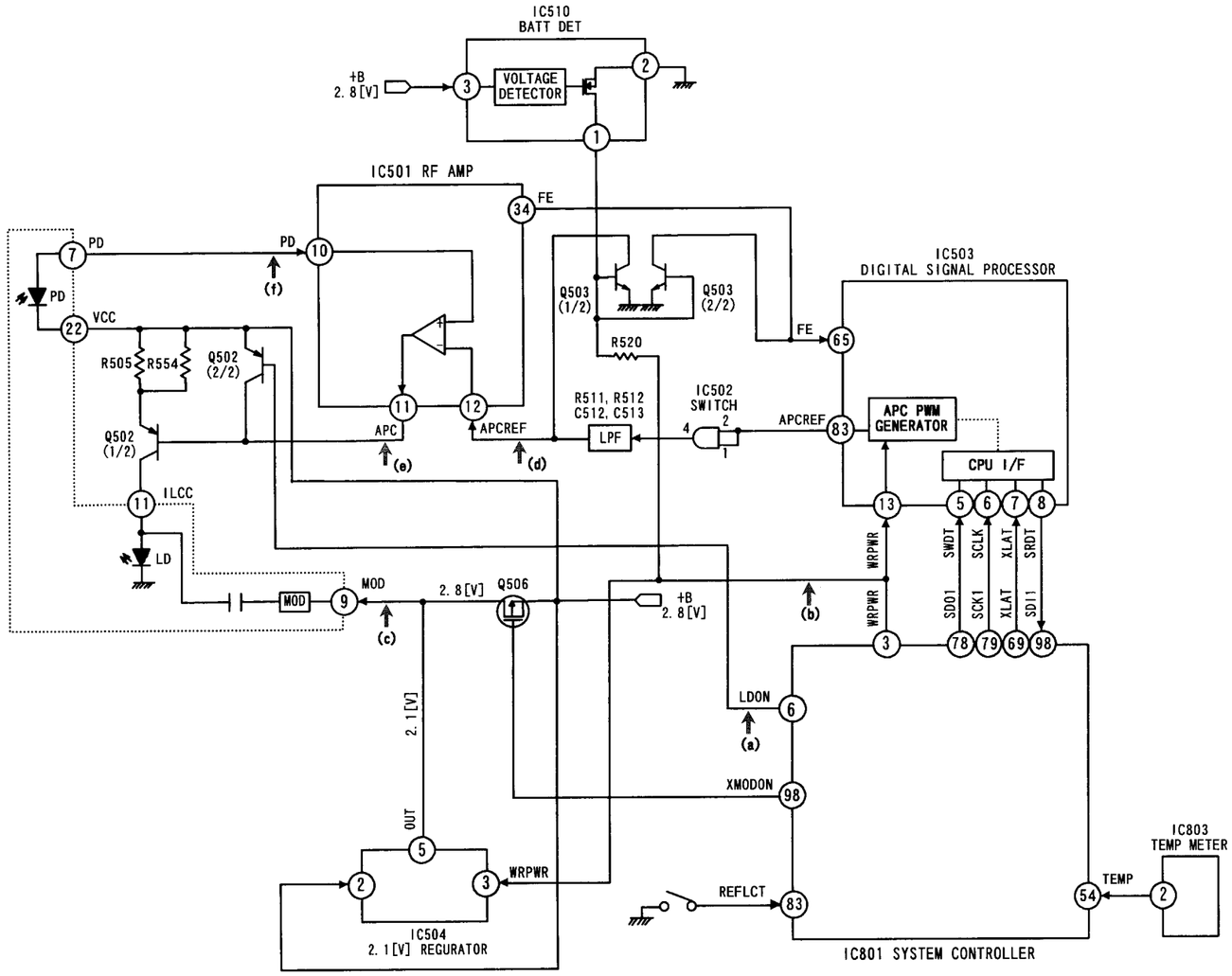
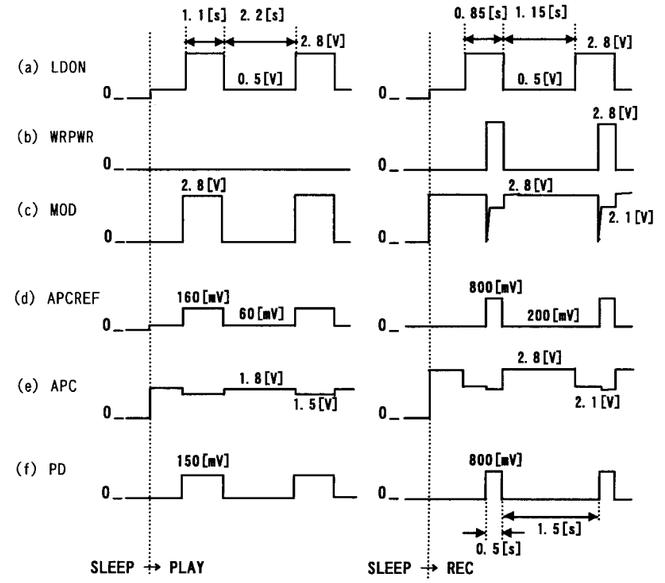
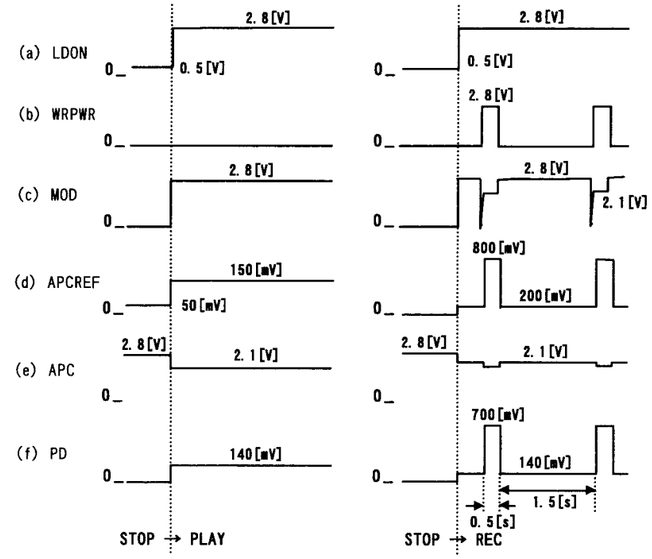


Fig. 8-1 APC and Laser Power Circuit



(A) When the battery is running



(B) When the DC power supply is running

9. OPERATIONS OF MECHANISM SECTION

9-1. Mechanism Mode

This unit uses the mechanism of the same system as the 2nd generation MZ-R2 and has the following three modes.

■ Eject mode
- Mode which ejects the disc when the unit is stopping.
- The top cover opens when the OPEN key is slid.

■ Playback mode
- Mode for playing back discs.
- The disc holder is locked, preventing the disc from being ejected. (The OPEN key has no effect when slid.)
- The eject mode is set back when the STOP key is pressed.

■ Recording mode
- Mode for recording discs.
- Like the playback mode, the upper cover will be locked.
- The magnetic head descends onto the disc.
- The eject mode is set back when the STOP key is pressed.

9-2. Stepping Motor

As shown in **Fig. 9-1** the changing of the mechanism mode is performed by the rotation of the stepping motor. When the power supply is connected to the unit, the system controller IC801 performs detection of the INITIAL switch. When the input of Pin ⑭ [INTSW] is "H" (not eject mode), the system controller IC rotates the stepping motor in the reverse direction to set the eject mode. Next, when playback operations begin with the pressing of the PLAY key, the system controller IC rotates the stepping motor in the normal direction after approximately 4 seconds, and sets the playback mode. As a result, the cam lever operates together with the rack lever of the mechanism chassis by the rotation of the motor, to disconnect with the OPEN key and lock the holder. When the REC key is slid, the magnetic head descends. Lastly, when the STOP key is pressed, the system controller IC rotates the stepping motor in the reverse direction, and sets the eject mode.

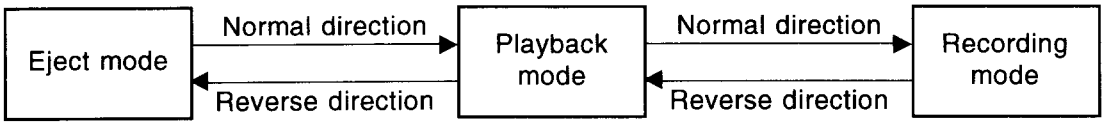


Fig. 9-1 Change in Mechanism Mode

9-3. Change in Mechanism Mode

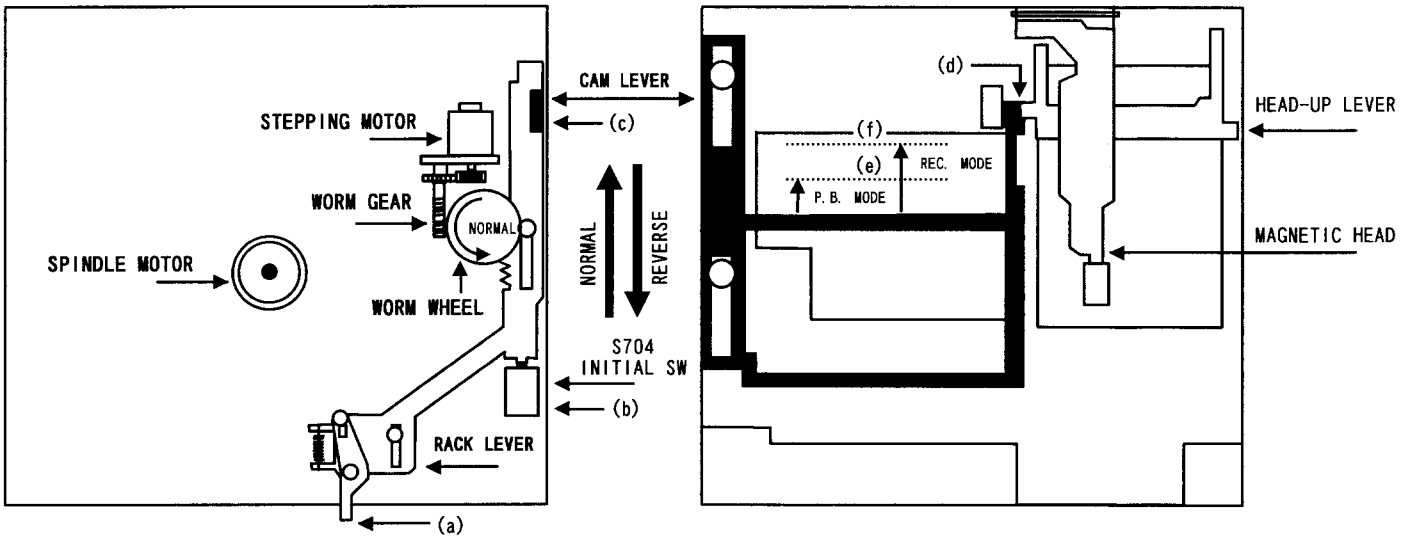


Fig. 9-2 Change in Mechanism Operations

Fig. 9-2 shows the change in the mechanism operations.

1. Eject mode

The figure shows the eject mode state. As shown, during this mode, the projection of the rack lever (a) projects out of the mechanism deck. As a result, the projection of the rack lever and the mechanism of the OPEN key connect, enabling the disc holder to be opened and closed. The INITIAL switch (b) is turned ON by the rack lever at the same time. As a result, the system controller IC801 detects that the mechanism is in the eject mode. At the part (d), the head up lever is put on the projection of the cam lever so that the magnetic head cannot descend.

2. Playback mode

When the PLAY key is pressed, the stepping motor normal rotation signal is output from the system controller IC801. When the stepping motor rotates, the worm wheel rotates in the normal direction via the worm gear. As a result, the rack lever moves in the normal direction, disconnecting the projection (a) and mechanism of the OPEN key. At the same time, the INITIAL switch goes OFF when the rack lever moves. At part (c), because the rack lever and cam lever are connected, the cam lever moves to the position (e) according to the movement of the rack lever. At part (d), like in the eject mode, the head up lever will be put on the projection of the cam lever to prevent the magnetic head from descending.

3. Recording mode

When the REC key is slid, the stepping motor normal rotation signal is output from the system controller IC801, and like during playback, the cam lever moves to the position (f) together with the rack lever which moves in the normal direction. As a result, at part (d), the projection of the cam lever and head up lever are disconnected, and the magnetic head descends.

During the playback mode/recording mode, when the STOP key is pressed, the stepping motor reverse rotation signal will be output from the system controller IC801, and the mechanism mode will be set to the eject mode.

9-4. Stepping Motor Control Circuit

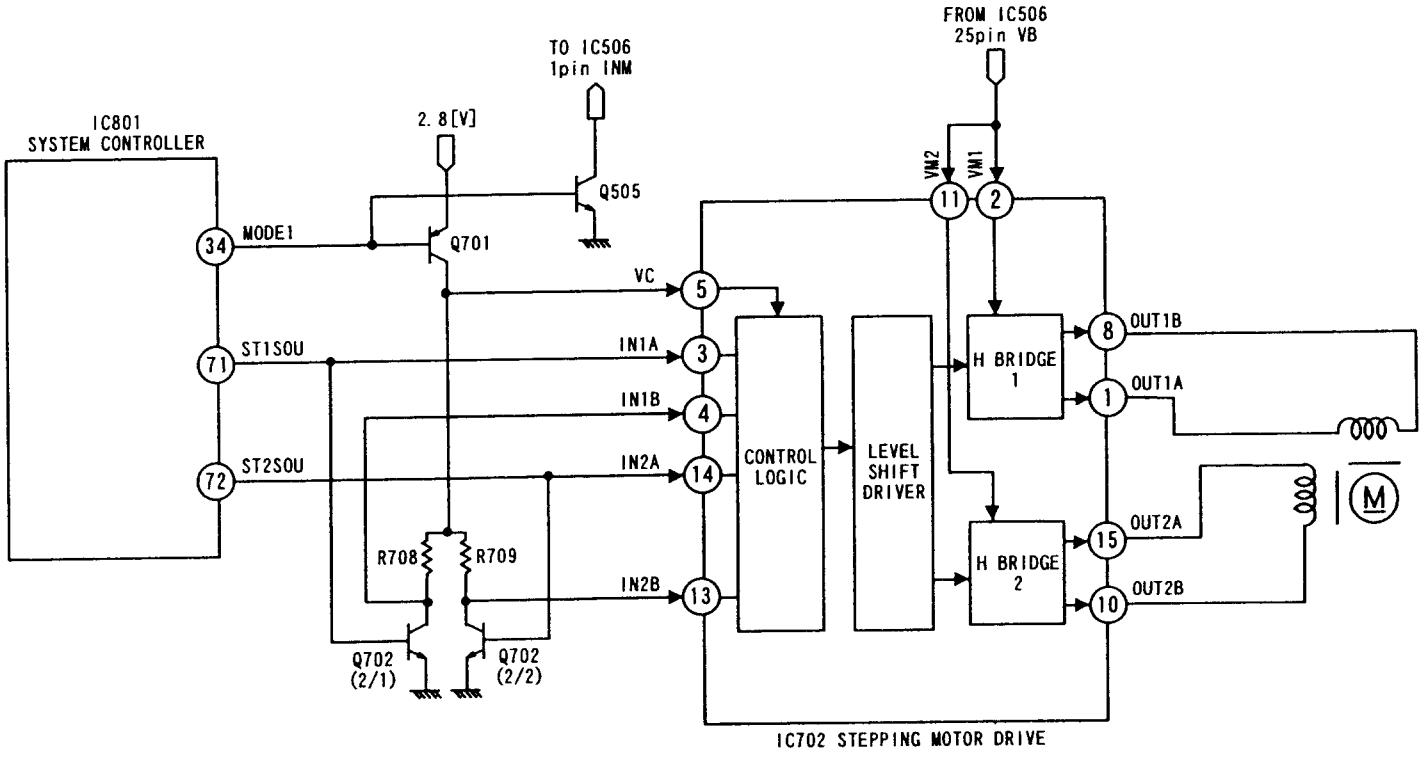


Fig. 9-3 Stepping Motor Control Circuit

Fig. 9-3 shows the stepping motor control circuit. First, Q701 is turned ON and Q505 OFF by the "L" output from Pin ㉞ [MODE1] of the system controller IC801. As a result of Q701 turning ON, 2.8V is input to Pin ⑤ [VC] of the stepping motor driver IC702 and the IC702 starts. At the same time, as a result of Q505 going OFF, the 1.5V generated in the 1.5 V step down regulator inside the REC driver IC506 is input to Pins ② [VM1] and ⑪ [VM2] of IC702 as the H bridge power voltage of the stepping motor from Pin ㉕ [VB]. (For details, refer to "**5-3-6. Generation of Stepping Motor Driver Voltage/REC Driver Voltage**".)

Next, when IC702 is started, the stepping motor control signal output from Pins ㉑ [ST1SOU] and ㉒ [ST2SOU] of the system controller IC801 is input to Pins ③ [IN1A] and ⑭ [IN2A] of IC702. At the same time, the output signals of [ST1SOU] and [ST2SOU] are reversed by Q702 and input to Pins ④ [IN1B] and ⑬ [IN2B]. The output signals of [ST1SOU] and [ST2SOU] are 50% duty pulses whose phases are 90° deviated from each other. As shown in **Fig. 9-4**, when the stepping motor is driven in the normal direction, the [ST2SOU] output waveform is deviated 90° to the right from the output waveform of [ST1SOU], and output. When the stepping motor is driven in the reverse direction, the output waveform of [ST2SOU] will be deviated 90° to the left from the output waveform of [ST1SOU], and output. Consequently, the signals output from Pins ① [OUTA1] and ⑮ [OUT2A] of IC702 will be output with their phases deviated by 90°. Likewise, the signals output from Pins ⑧ [OUTB] and ⑩ [OUT2B] will also be output with their phases deviated by 90°. The 4-pole stepping motor is driven by the difference in the phases of these output signals, and rotated in the normal or reverse direction according to the mode set.

Table. 9-1 Stepping Motor Driver Inputs/Outputs

IN1A (IN2A)	IN1B (IN2B)	OUT1A (IN2A)	OUT1B (IN2B)
L	L	L	L
L	H	L	H
H	L	H	L
H	H	Z	Z

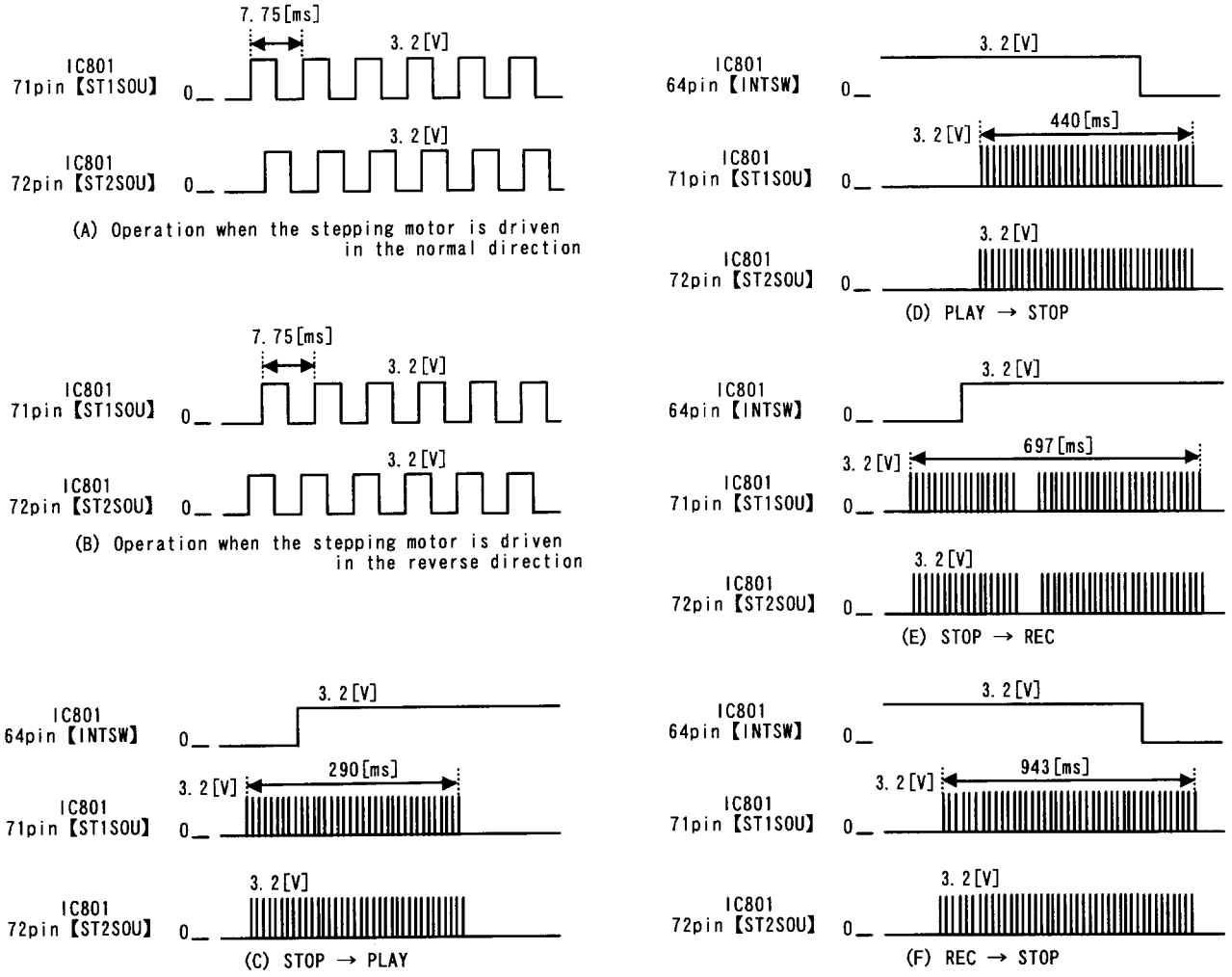


Fig. 9-4 Waveform Timing during Operations

10. Appendix (Semiconductor Specifications)

10-1. CXA2523R

CXA2523R

RF Matrix Amplifier for MD

Outline

The CXA2523R is a bipolar IC for processing the RF signals and servo signals used for the recording and playing of the Mini Disc (MD).

Compared to the CXA1981AQ/AR, it has less number of adjusting points and external parts, thus realizing low power consumption.

It has been designed for use with the CXD2650R.

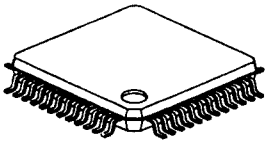
Features

- Low power consumption
- Low voltage single power supply
- Little external parts
- For recording/playback
- Mode switching by serial interface

Functions

- Pit/groove switching RF amplifier (With AGC and equalizer function)
- 3T detection output for focus bias adjustment
- Gain switching type I-V amplifier
- Light amount signal output/peak hold output/bottom hold output
- Focus error signal output
- 3-spot method tracking error signal output
- Gain switching SW for EF balance adjustment
- Sled error signal output
- ADIP binarized output
- Equalizer, 3T BPF, wobble BPF for variable function
- VREF output
- APC PD amplifier
- Temperature sensor amplifier
- Sleep function
- Ope-amplifier and comparator for users
- Mode switching by serial interface

48 pin LQFP (Plastic)



Maximum absolute ratings (Ta=25°C)

• Power supply voltage	Vcc—GND	12	V
• Operating temperature	Topr	–20 to +75	°C
• Storage temperature	Tstr	–65 to +150	°C
• Allowable loss (when mounted on PCB)			
	PD	750	mW

Operating conditions (Ta=25°C)

• Power supply voltage		
Single power supply	2.0 to 3.6	V
• Consumption power	Approx. 20 mW (when 2.8V)	

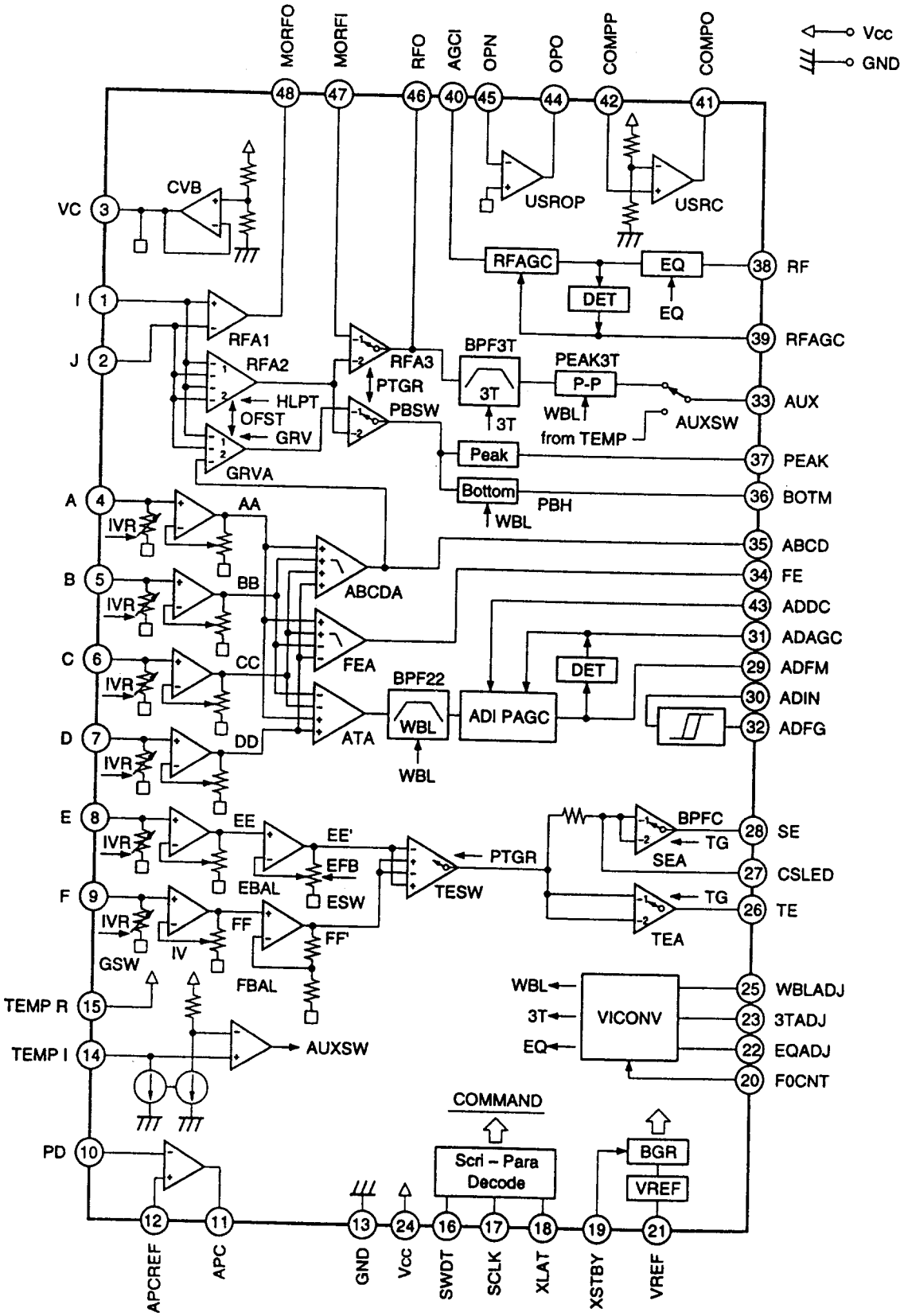
Purpose

Low voltage MD recorders/players

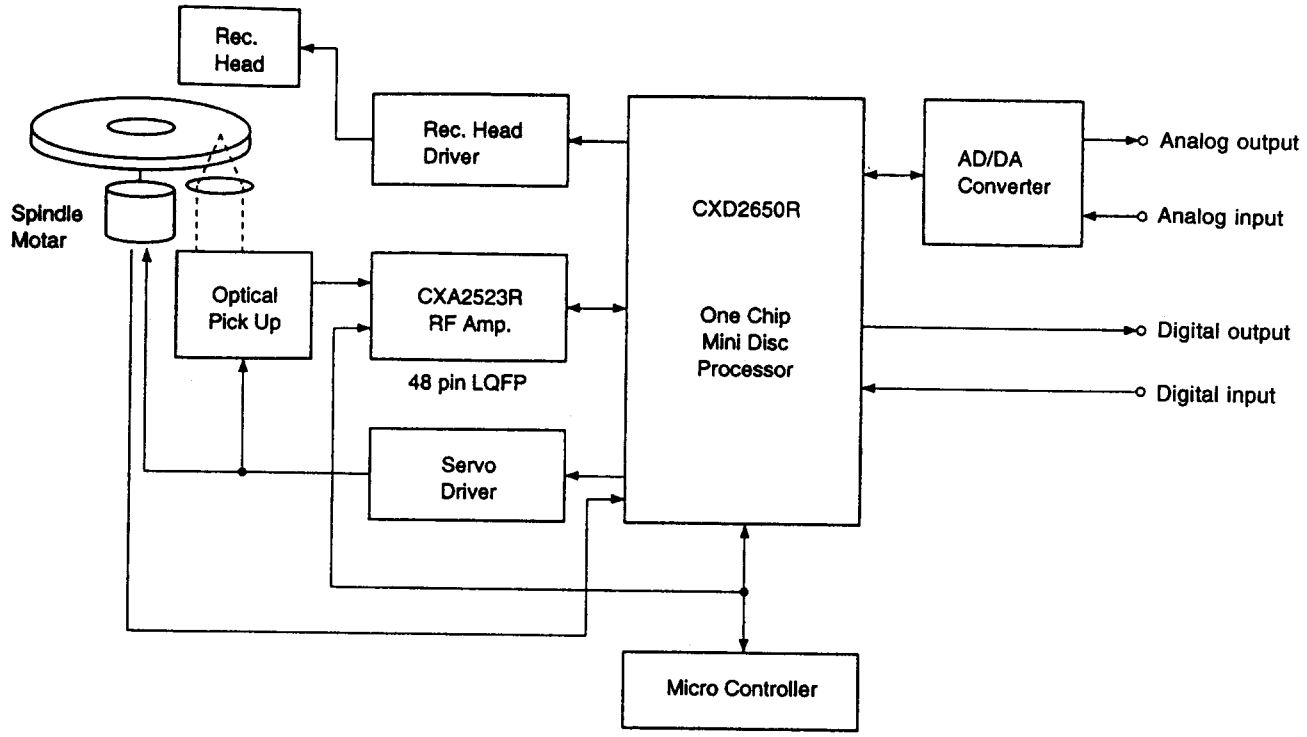
Structure

Bipolar silicon monolithic IC

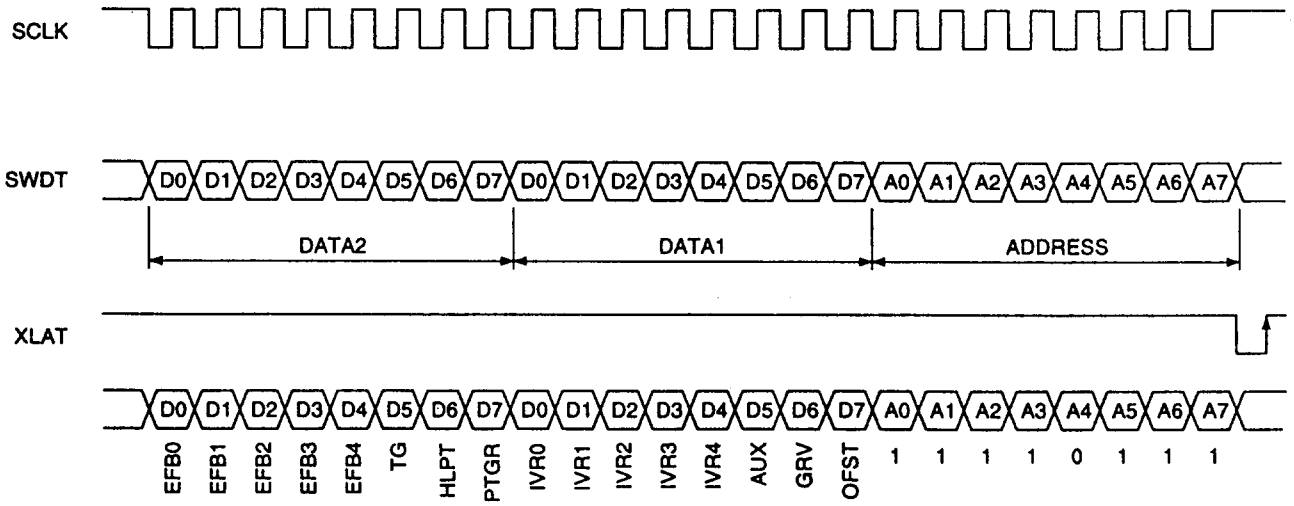
Block Diagram



System Block Diagram

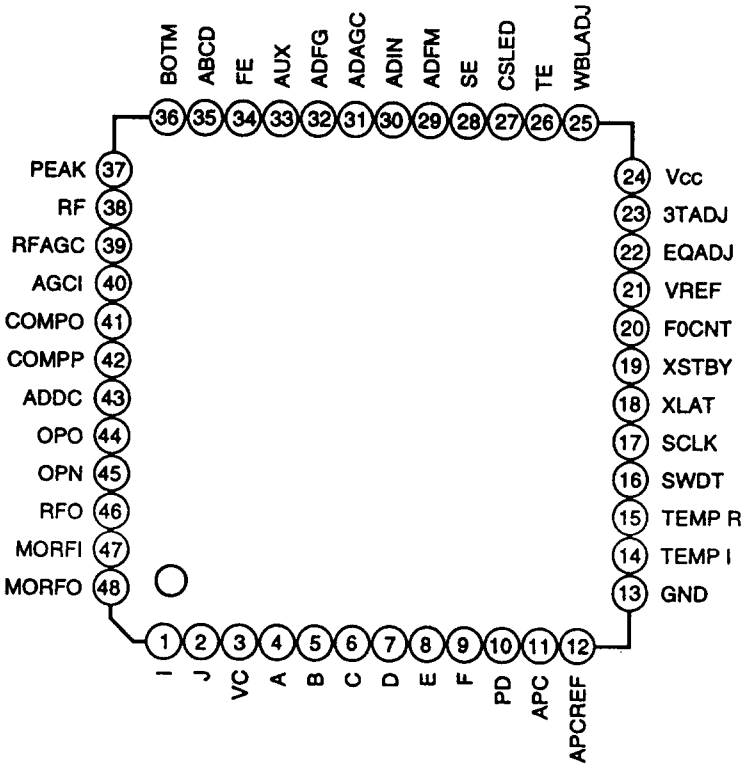


Serial Command Timing Chart

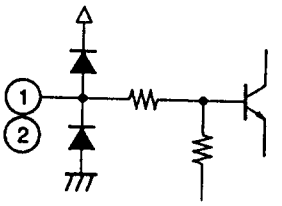
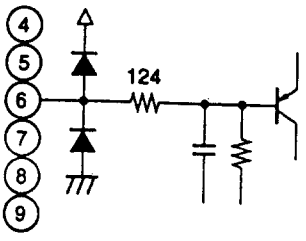

SCLK
SWDT
D0 D1 D2 D3 D4 D5 D6 D7 D0 D1 D2 D3 D4 D5 D6 D7 A0 A1 A2 A3 A4 A5 A6 A7
DATA2
DATA1
ADDRESS
XLAT
D0 D1 D2 D3 D4 D5 D6 D7 D0 D1 D2 D3 D4 D5 D6 D7 A0 A1 A2 A3 A4 A5 A6 A7
EFB0 EFB1 EFB2 EFB3 EFB4 TG HLPT PTGR IVR0 IVR1 IVR2 IVR3 IVR4 AUX GRV OFST 1 1 1 1 0 1 1 1

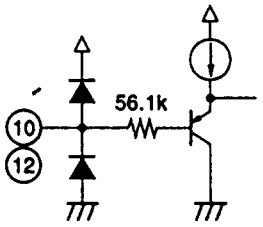
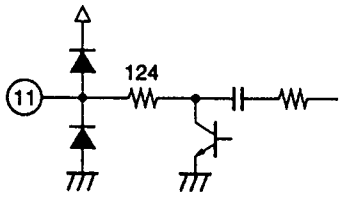
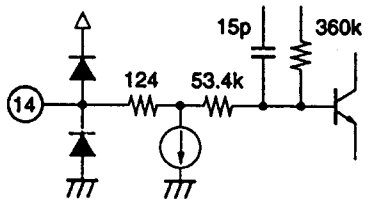
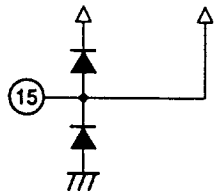
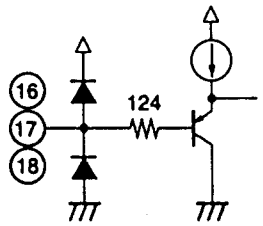
Maximum operating frequency	3.0 MHz
Input threshold value	0.36 Vcc

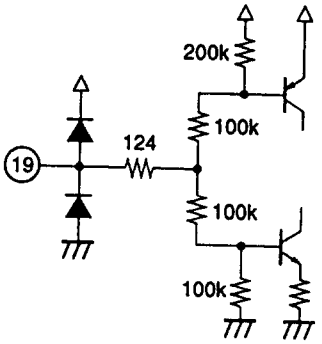
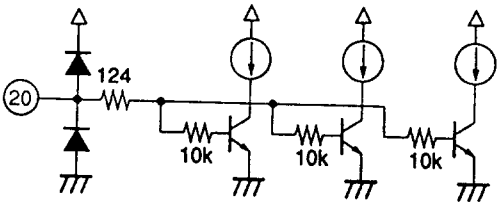
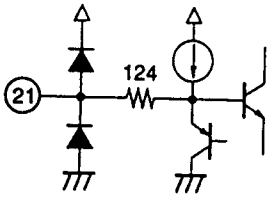
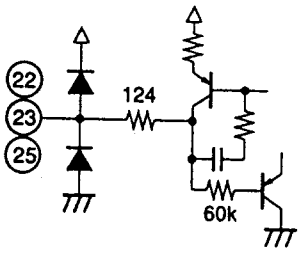
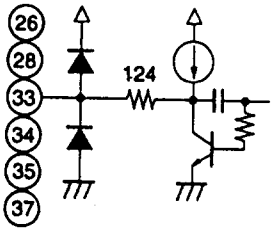
Pin Configuration (Top View)

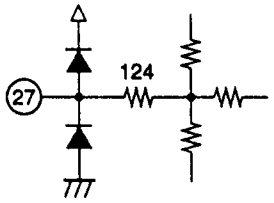
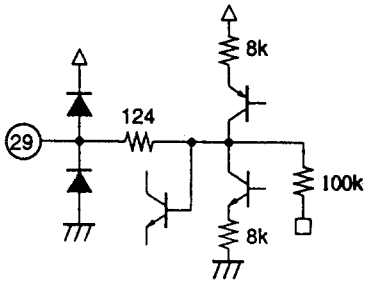
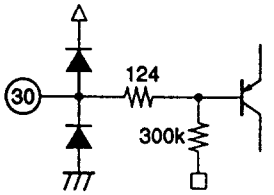
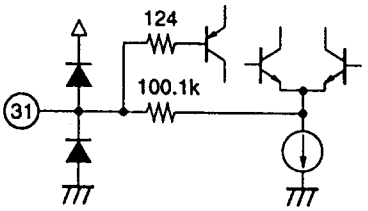
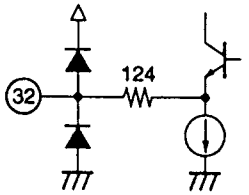
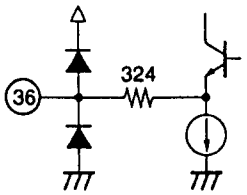


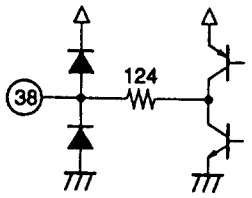
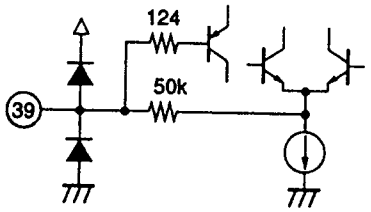
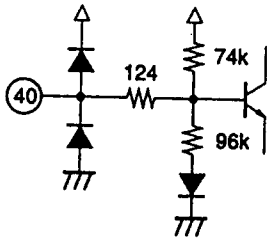
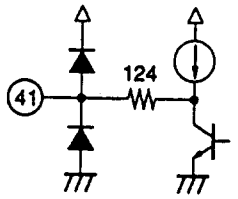
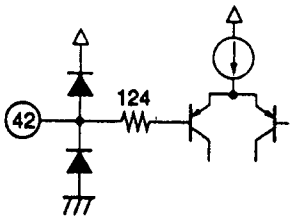
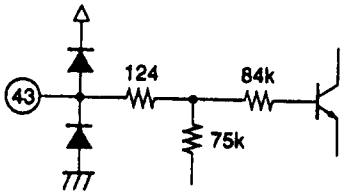
Pin Functions

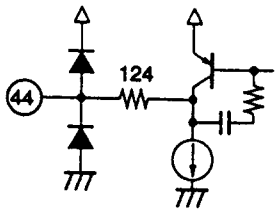
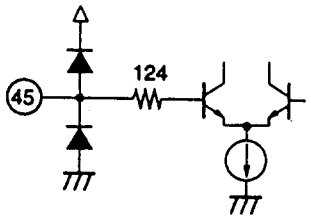
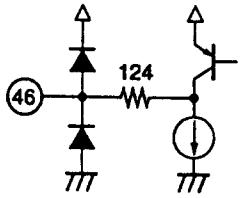
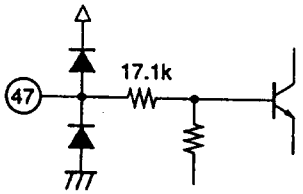
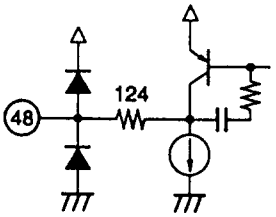
Pin No.	Pin Symbol	I/O	Equivalent Circuit	Function
1	I	I		Input pin of I-V converted RF signals I.
2	J	I		Input pin of I-V converted RF signals J.
3	VC	O		Vcc/2 voltage output pin.
4	A	I		Current input pin of main beam servo signal A.
5	B	I		Current input pin of main beam servo signal B.
6	C	I		Current input pin of main beam servo signal C.
7	D	I		Current input pin of main beam servo signal D.
8	E	I		Current input pin of side beam servo signal E.
9	F	I		Current input pin of side beam servo signal F.

Pin No.	Pin Symbol	I/O	Equivalent Circuit	Function
10	PD	I		Light amount monitor signal input pin. Connects to FAPC or RAPC, performs I-V conversion using a resistor, and performs light amount detection.
12	APCREF	I		Laser power setting reference voltage input pin.
11	APC	O		Laser APC output pin.
13	GND	—		GND pin.
14	TEMP I	I		Temperature sensor connection pin.
15	TEMP R	I		Temperature sensor connection pin. Outputs the reference voltage.
16	SWDT	I		Serial data input pin.
17	SCLK	I		System clock input pin.
18	XLAT	I		Latch signal input pin. (Latches at "L".)

Pin No.	Pin Symbol	I/O	Equivalent Circuit	Function
19	XSTBY	I		Standby input pin. (Stands by at "L".)
20	F0CNT	I		BPF22, EQ, BPF3T center frequency control voltage input pin.
21	VREF	O		Reference voltage output pin.
22	EQADJ	I/O		External resistance pin for EQ center frequency setting.
23	3TADJ	I/O		External resistance pin for BPF3T center frequency setting.
25	WBLADJ	I/O		External resistance pin for BPF22 center frequency setting.
24	Vcc	—		Power supply pin.
26	TE	O		Tracking error signal output pin.
28	SE	O		Sled error signal output pin.
33	AUX	O		I3 output /temperature signal output pin. Switches with serial commands.
34	FE	O		Focus error signal output pin.
35	ABCD	O		Main beam servo detector light amount signal output pin.
37	PEAK	O		RF/ABCD peak hold signal output pin.

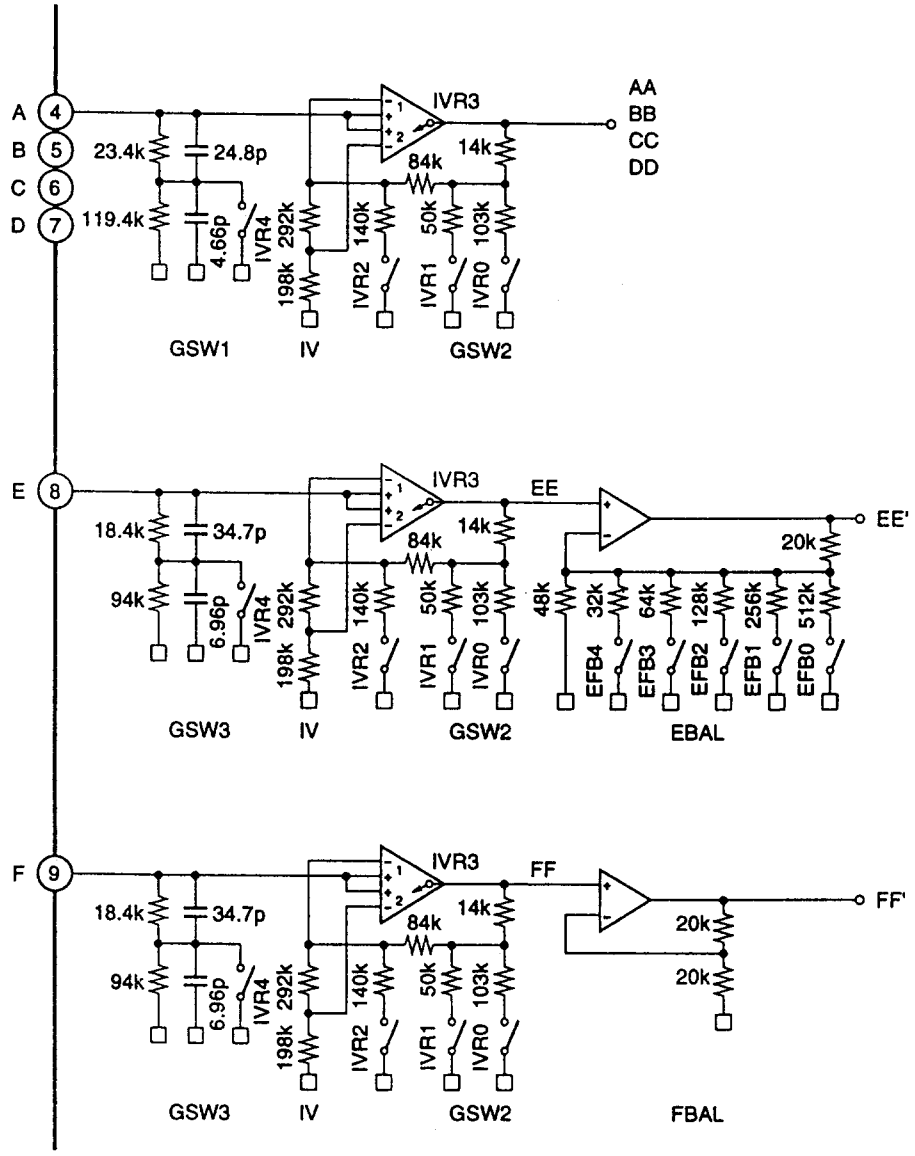
Pin No.	Pin Symbol	I/O	Equivalent Circuit	Function
27	CSLED	—		Sled error signal LPF capacitor connection pin.
29	ADFM	O		ADIP FM signal output pin.
30	ADIN	I		ADIP signal comparator input pin. Connected to ADFM by AC coupled.
31	ADAGC	—		ADIPAGC capacitor connection pin.
32	ADFG	O		ADIP binarized signal output pin.
36	BOTM	O		RF/ABCD bottom hold signal output pin.

Pin No.	Pin Symbol	I/O	Equivalent Circuit	Function
38	RF	O		RF equalizer output pin.
39	RFAGC	—		RFAGC capacitor connection pin.
40	AGCI	I		RFAGC input pin. Pin input with the output of the RF amplifier after it is AC coupled.
41	COMPO	O		User comparator output pin.
42	COMPP	I		User comparator input pin.
43	ADDC	I/O		External capacity pin for low band blocking of ADIP amplifier.

Pin No.	Pin Symbol	I/O	Equivalent Circuit	Function
44	OPO	O		User ope-amplifier output pin.
45	OPN	I		User ope-amplifier inversion input pin.
46	RFO	O		RF amplifier output pin. Serves as eye pattern checkpoint.
47	MORFI	I		Pin input with RF signal of groove after it is AC coupled.
48	MORFO	O		Output pin of RF signal of groove.

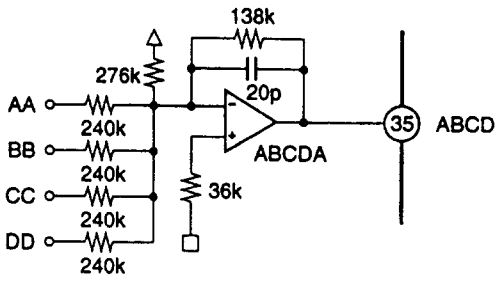
Outline of Functions (The voltage Vcc in the figure is 2.8V.)

1. I-V amplifier



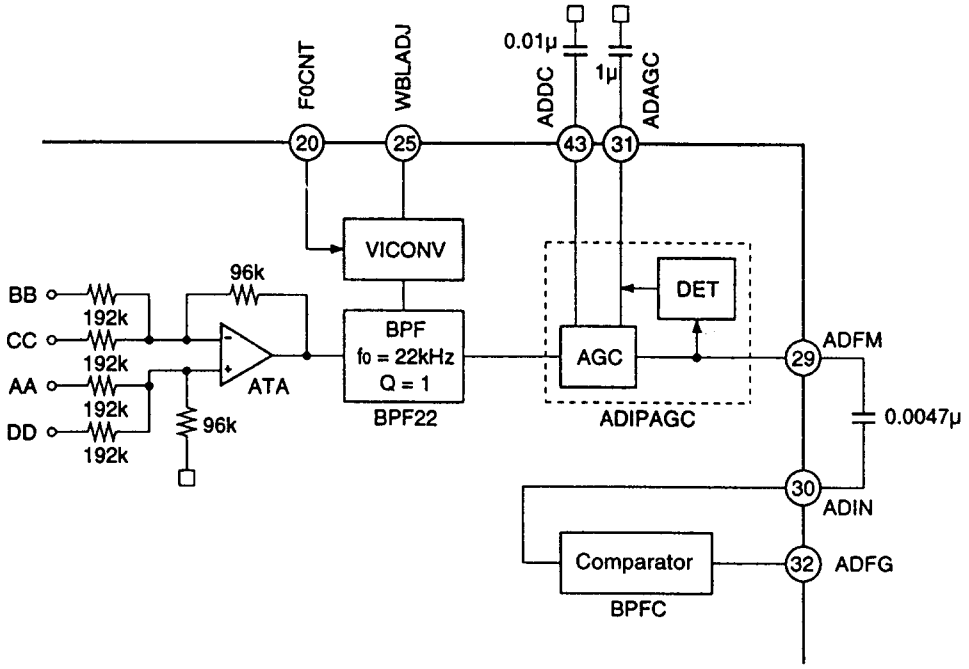
Amplifier which I-V converts the A to F signals (photo detector signals) from the optical pickup. It has switches IVR0 to IVR4 to adjust the gain inside the input. The A to D amplifiers have the same structure, and they are composed of GWS1, GWS2 (gain switches), and I-V (I-V amplifier). Although the E and F I-V amplifiers have different resistances, their structures are the same as the A to D amplifiers. The E I-V amplifier is equipped with the balance switches EFB0 to EFB4. The F I-V amplifier does not have balance switches, and is fixed by a resistor inside the IC. The IVR is able to switch and adjust the gain in steps of 1.1 dB, while the EFB is able to switch and adjust the EF balance in steps of 3% using the serial commands from the respective microprocessors described later.

2. ABCD amplifier



Circuit for obtaining the main spot light amount signal. The sum of the four signals (AA, BB, CC, and DD) I-V converted by GSW1, GSW2, and the I-V amplifiers are obtained by the ABCDA, and output to Pin ㉟.

3. ADIP amplifier

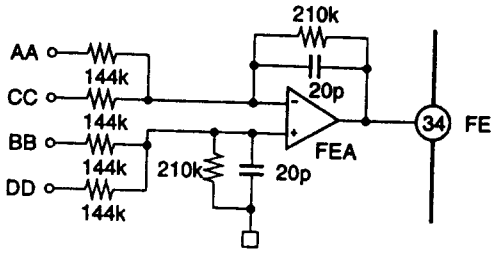


For recording discs, the groove area is wobbled by the FM signal which has a 22.05 kHz carrier, so that the absolute addresses are recorded on the whole recorded side. To detect the wobbling components, the I-V converted main spot push-pull signal ((AA+DD)-(BB+CC)) is generated by ATA, input to the BPF22 (center frequency f0=22 kHz) to eliminate the noise components.

The output signal (a) from the BPF22 is controlled by ADIPAGC so that the amplitude becomes 750 mVp-p. The time constant of this AGC is determined by the external capacity (1 µF) of Pin ㉛, and closes the loop inside.

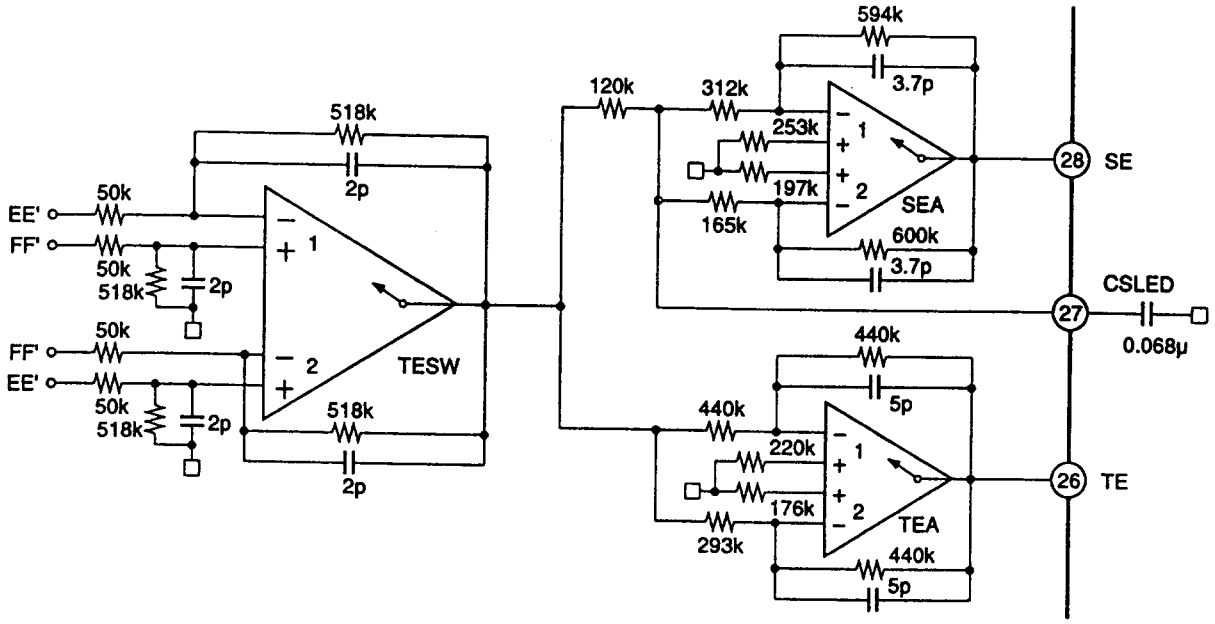
After this output is DC-cut by the coupling capacitor (0.0047 µF) between Pins ㉙ and ㉚, and binarized by the comparator (BPFC), and output to Pin ㉜ (ADFG).

4. Focus error amplifier



Circuit which generates the focus error signal from the AA to DD signals I-V converted.

5. Tracking error amplifier/sled error amplifier



The photo diode current of the side spot is I-V converted by the EIV and FIV amplifier, passed through EBAL and FBAL, and subtracted by TESW as the EE' and FF' signals. When the TESW amplifier sets the serial command PTGR (DATA2 to D7) to "L", "1" is selected. When it sets it to "H", "2" is selected.
The TESW output serves as the sled error (SE) and tracking error (TE). The SE signal is output from the I-V amplifier (SEA) with a time constant determined by the external capacity (0.068 μF) of Pin ㉗. The TE signal is output from the I-V amplifier (TEA). Both SEA and TEA can be switched by the serial command. When the TG of the serial command is set to "L", "1" is selected. When set to "H", "2" is selected.

6. RF amplifier

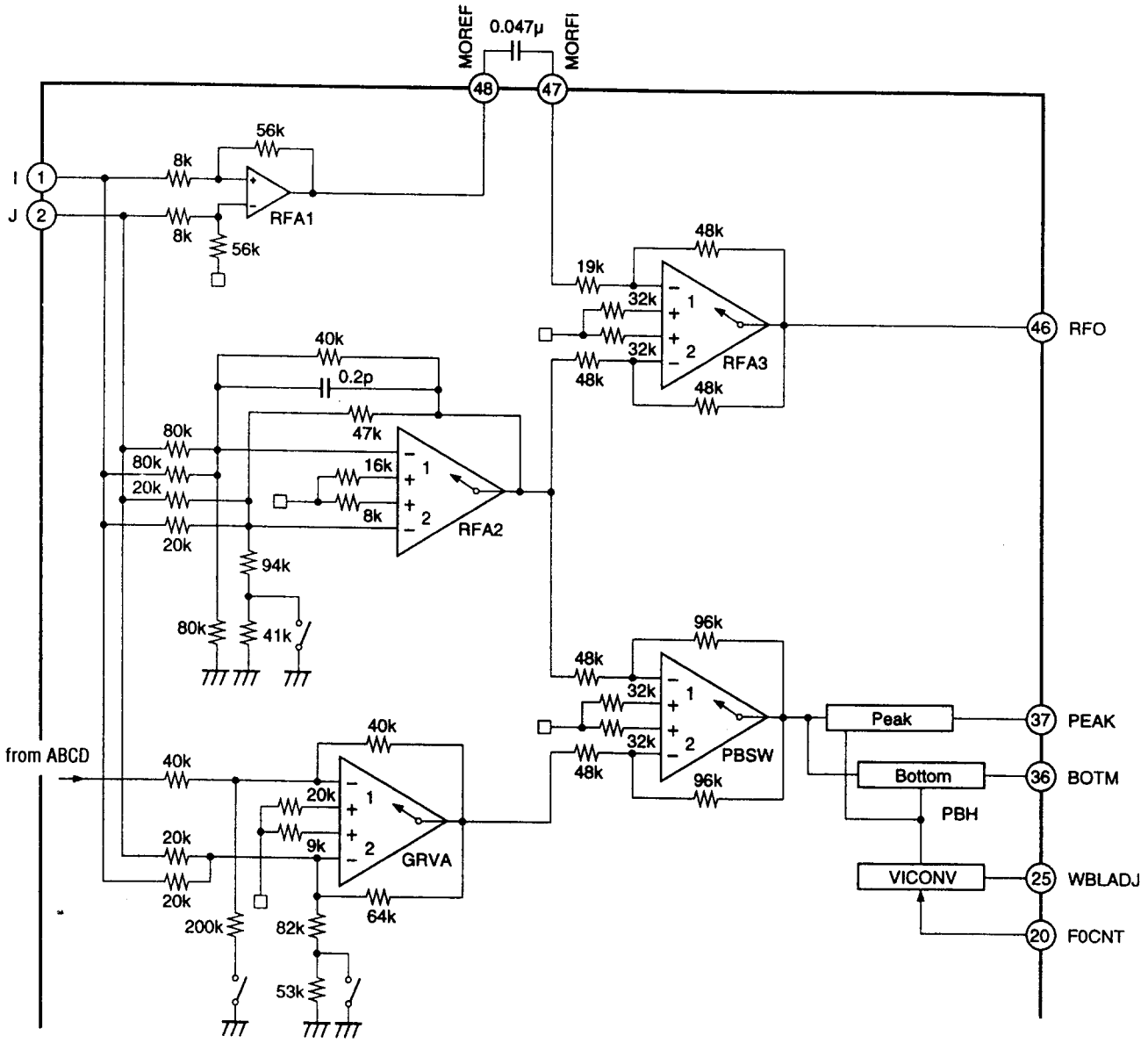
The two RF signals I-V converted by the differential optical system pickup are input to the I and J of Pin ① and ②. The difference signal which is the groove signal is made in RFA1 and the sum signal which is the Pits signal is made in RFA2. To eliminate the DC offset of the RFA1 output, the section between MORFO and MORFI is AC coupled at 0.047 μF.
RFA2 is composed of two amplifiers with different gains. These are switched by the serial command HLPT (DATA2 to D6) to generate the Pits signal. For TOCs of recording MDs, and MDs for playback only with low reflectance, the HLPT is set to "L" so that "2" is selected. For playback only MDs with high reflectance, it is set to "H" so that "1" is selected. In the playback of grooves, set HLPT (DATA2 to D6) to 0.
RFA3 is a switch amplifier which outputs the eye pattern to RFO by switching between pits and groove, and operates using the serial command PTGR (DATA2 to D7). For groove signals, PYGR is set to "H" so that "1" is selected, and for Pits signals, set it to "L" so that "2" is selected.

The GRVA is an amplifier which generates the signals required for generating PEAK and BOTTOM from the A to D signals, or I and J signals, and is controlled by the serial command GRV (DATA1 to D6). When recording on the groove (when recording on recording MDs), it sets GRV to "L" so that "1" is selected, and generates the Groove signal from (A+B+C+D). To read the groove signal (when playing recording MDs), it sets GRV to "L" so that "2" is selected, and generates the groove signal from (I+J). To read Pits, set GRV to "H".

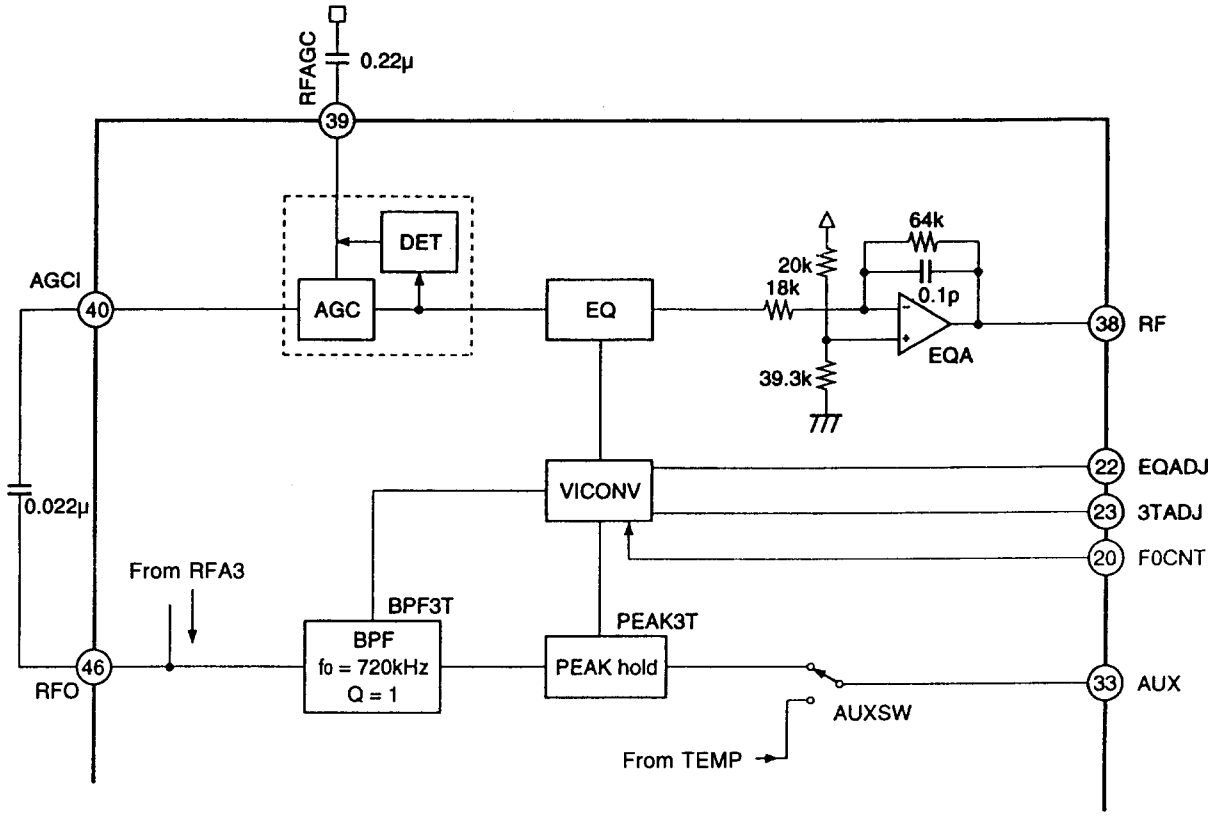
The PEAK signal (Pin ㊲) and BOTTOM signal (Pin ㊱) are generated by PBH from the Pits signal and Groove signal selected by PBSW. When generating these signals, a negative offset must be added to the Pits/Groove signal. This negative offset differs according to the power supply voltage. This negative offset switch is located at both RFA2 and GRVA, and is set by the serial command OFST (DATA1 to D7). PBSW control is performed by the serial command PTGR (DATA2 to D7). When Groove, set PTGR to "H". When Pits, set it to "L". The PEAK/BOTTOM of the Pits/Groove signal selected by this PBSW is detected by PBH.

Conditions			OFST DATA1-D7	GRV DATA1-D6	PTGR DATA2-D7	HLPT DATA2-D6
Vcc<2.5V	Pits	High reflectance	1	1	0	1
		Low reflectance	1	1	0	0
	Groove	Recording	1	1	1	X
		Playback	1	0	1	0
Vcc≧2.5V	Pits	High reflectance	0	1	0	1
		Low reflectance	0	1	0	0
	Groove	Recording	0	1	1	X
		Playback	0	0	1	0

(1: H, 0: L, X: Don't care)

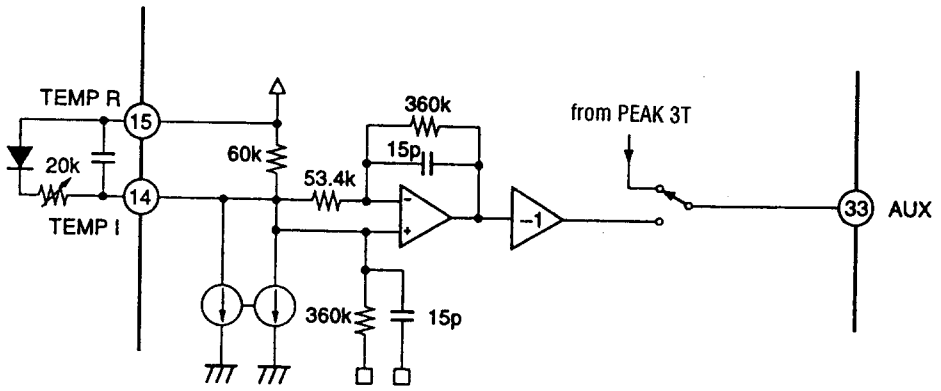

MOREF
0.047μ
MORFI
48
47
I
1
J
2
56k
8k
RFA1
8k
56k
48k
19k
32k
RFA3
32k
48k
48k
46
RFO
40k
0.2p
47k
80k
80k
20k
16k
8k
RFA2
20k
94k
80k
41k
96k
48k
32k
PBSW
32k
48k
96k
Peak
37
PEAK
Bottom
36
BOTM
PBH
VICONV
25
WBLADJ
20
FOCNT
from ABCD
40k
40k
20k
9k
GRVA
20k
20k
64k
200k
82k
53k

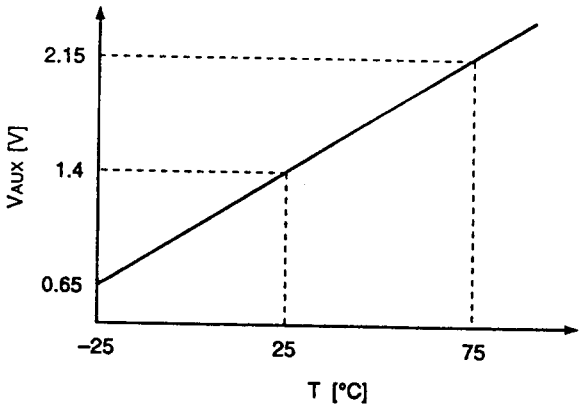
7. RF later stage amplifier



The later stage of the RF amplifier is composed of the equalizer and 3T peak detection circuit.
The RFO signal output from Pin ㊻ is input to AGCI (Pin ㊵) via the AC coupling capacitor (0.022 µF) for eliminating the DC offset and gain-controlled by RFAGC. The RFAGC determines the time constant according to the external capacity (0.22 µF) attached to Pin ㊴ (RFAGC), and closes the loop using the internal detector. The signal controlled to 0.65 Vp-p is output to RF (Pin ㊳) as the 1.0 Vp-p signal via EQ and EQA.
On the other hand, the signal from RFA3 is peak-detected at the PESK hold circuit (PRAK 3T) with a 760 µs/V time-constant via the BPF3T (fo=720 kHz: 3T frequency), and input to AUXSW. The AUXSW sets the serial command AUC (DATA1 to D5) to "L" to obtain I3 output (3T amplitude absolute value) from AUX (Pin ㉝).

8. TEMP circuit



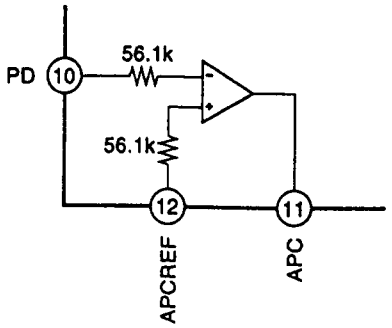


The optimum laser power used for the recording disc changes according to the temperature of the media surface. The TEMP circuit detects this temperature.

As this surface temperature of the media is difficult to measure, in actual operations, the surrounding temperature of the media is detected instead using the changes in the VF of the temperature sensor diode. The relations between the detected temperature T and output voltage V is;based on VC at T=25°C, the voltage changes by ±0.75V each time the temperature changes by ±50°C. (When Vcc=2.8V, the relation is as shown above.)

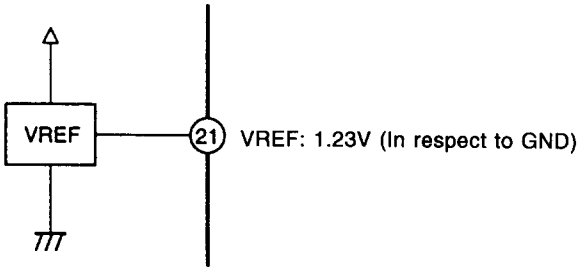
The temperature detected by the TEMP circuit is output from AUX (Pin ㉝) which is the AUXSW output by setting the serial command AUX (DATA1 to D5) to "H", and becomes the CXD2650 input voltage.

9. APC circuit



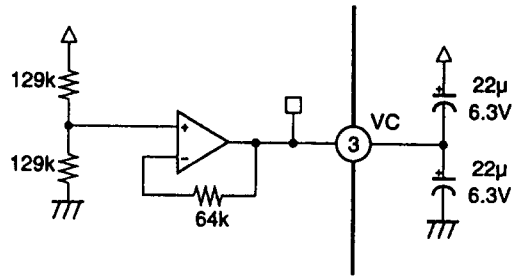
The APC circuit controls the laser power without being affected by the temperature characteristics of the laser diode.
The emitting power of the laser diode used for the MD recorder has the tendency to become unbalanced between the front and rear. For this reason, use a front monitor photo diode (FAPC: attach to the OP) for the light amount detector of the going light path. In the case of the pickup used for the MD player (for playback only), use a rear monitor diode (RAPC: inside the laser diode) as a light amount detector as in the CD player.
In APCREF (Pin ⑫), the reference voltage is received from the APCREF Pin of CXD2650. The voltage of APCREF (Pin ⑫) is 0V when the laser power is OFF.
When ope-amplifier is inserted between the APCREF Pin of CXD2650 and APCREG (Pin ⑫) of CXA2523R, since 0V cannot be output, the laser power cannot be turned OFF. Consequently, do not insert the ope-amplifier between these terminals.
The range of the operating voltage between PD (Pin ⑩) and APCREF (Pin ⑫) is 0V to (Vcc-1)V.
(When Vcc=2.8V, 0 to 1.8V)

10. Reference voltage generation circuit



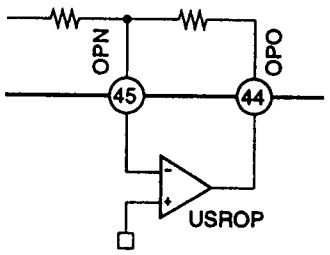
Reference voltage (band gap voltage) which does not depend on the power supply voltage made inside CXA2523R which outputs 1.23V (in respect to GND) from VREF (Pin ㉑).

11. Mid-point voltage generation circuit



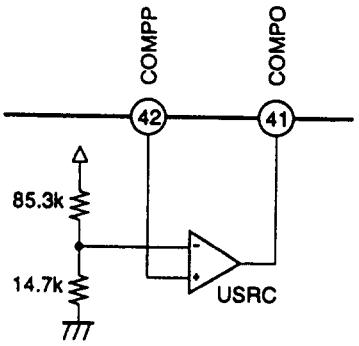
Outputs the mid-point voltage made inside CXA2523R from VC (Pin ③). The maximum output current is +2.2 mA, –4.0 mA, therefore, the motor and actuator cannot be connected.
To decrease the high band impedance, connect a electrolytic capacitor as shown in the figure.

12. User ope-amplifier



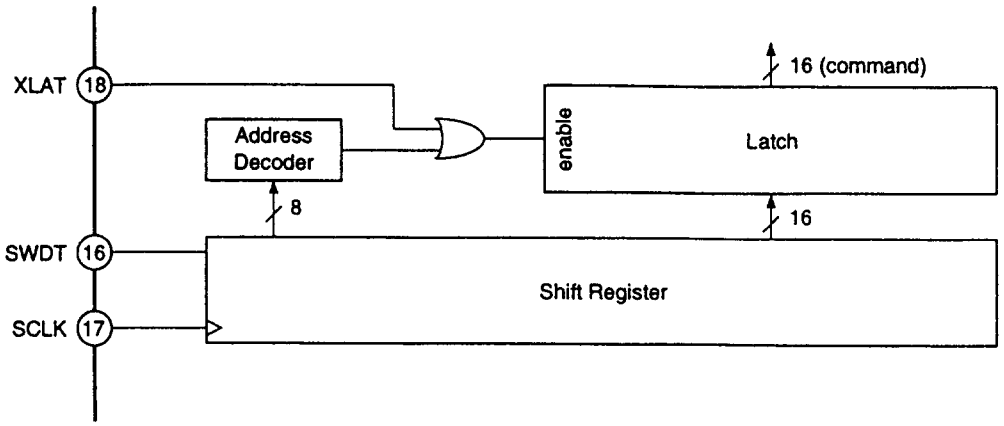
Inversion ope-amplifier which can be used by the user freely.
When not using it, connect OPN (Pin ㊺) to GND, and set OPO(Pin ㊹) to open.
Use gain above 40 times.
Use a sink current below 60 µA.

13. User comparator



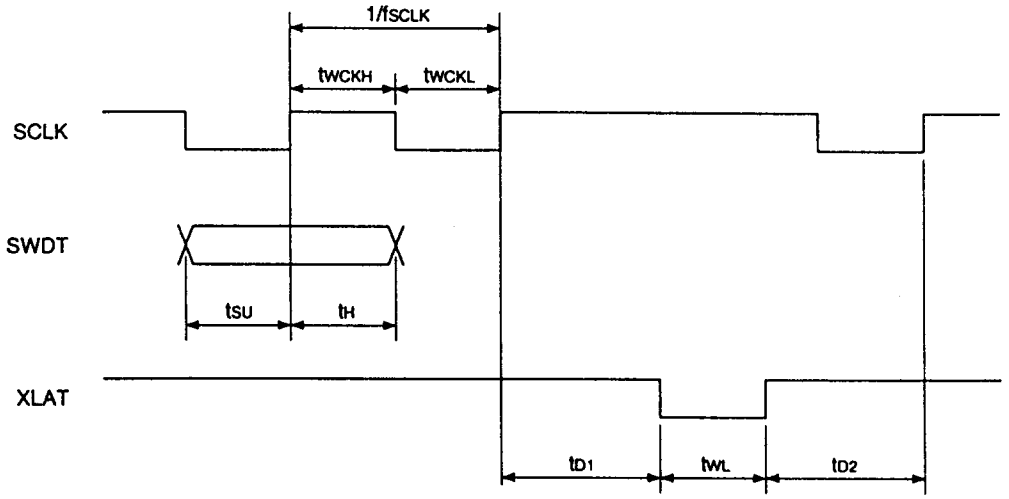
Positive phase comparator which can be used freely by the user.
Vth=0.15 x Vcc
When not using it, connect COMPP (Pin ㊷) to GND, and set COMPO (Pin ㊶) to open.
Use a sink current below 20 µA.

14. Serial command interface



Interface circuit which converts serial commands from the microprocessor to parallel, and sends to each switch.

Item	Symbol	Minimum	Standard	Maximum	Unit
Clock frequency	f_{SLCK}			3	MHz
Clock pulse width	t_{WCKH}, t_{WCLK}	150			ns
Setup time	t_{SU}	150			ns
Hold time	t_H	150			ns
Delay time 1	t_{D1}	250			ns
Delay time 2	t_{D2}	250			ns
Delay time 3	t_{WL}	500			ns



10-2. CXD2652R

CXD2652R

Digital signal processor for Mini Disc

Outline

The CXD2652R performs digital signal processing of Mini Discs in a single chip. It has been designed for use with the CXA2532R.

Features

- EFM encoder/decoder
- EFM digital PLL
- Built-in VCO for encoder PLL
- ACIRC encoder/decoder
- Accurate error correction
  (C1: Double correction, C2: Quadruple correction)
- ADIP decoder
- Peak level detection
- Digital servo (Focus, tracking, sled, spindle)
- Servo AGC
- Servo auto sequencer
- Adjustment of servo system using microprocessor
- System gain adjustment
- Fine search
- Rich memory access function with little burden on microprocessor software
- External DRAM address space (4M, 16M, 32M bits)
- ATRAC encoder/decoder
- ATRAC high sound quality algorithm
- Compatible with 20 bits digital in/out, 24 bits analog in/out
- Digital in (digital PLL)/out
- Incorporates a sampling rate converter compatible with digital in Fs=32 kHz, 44.1 kHz, 48 kHz

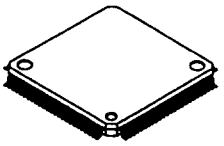
Structure

Silicon gate CMOS IC

Purpose

Mini Disc recorders, players

100 pin LQFP (Plastic)



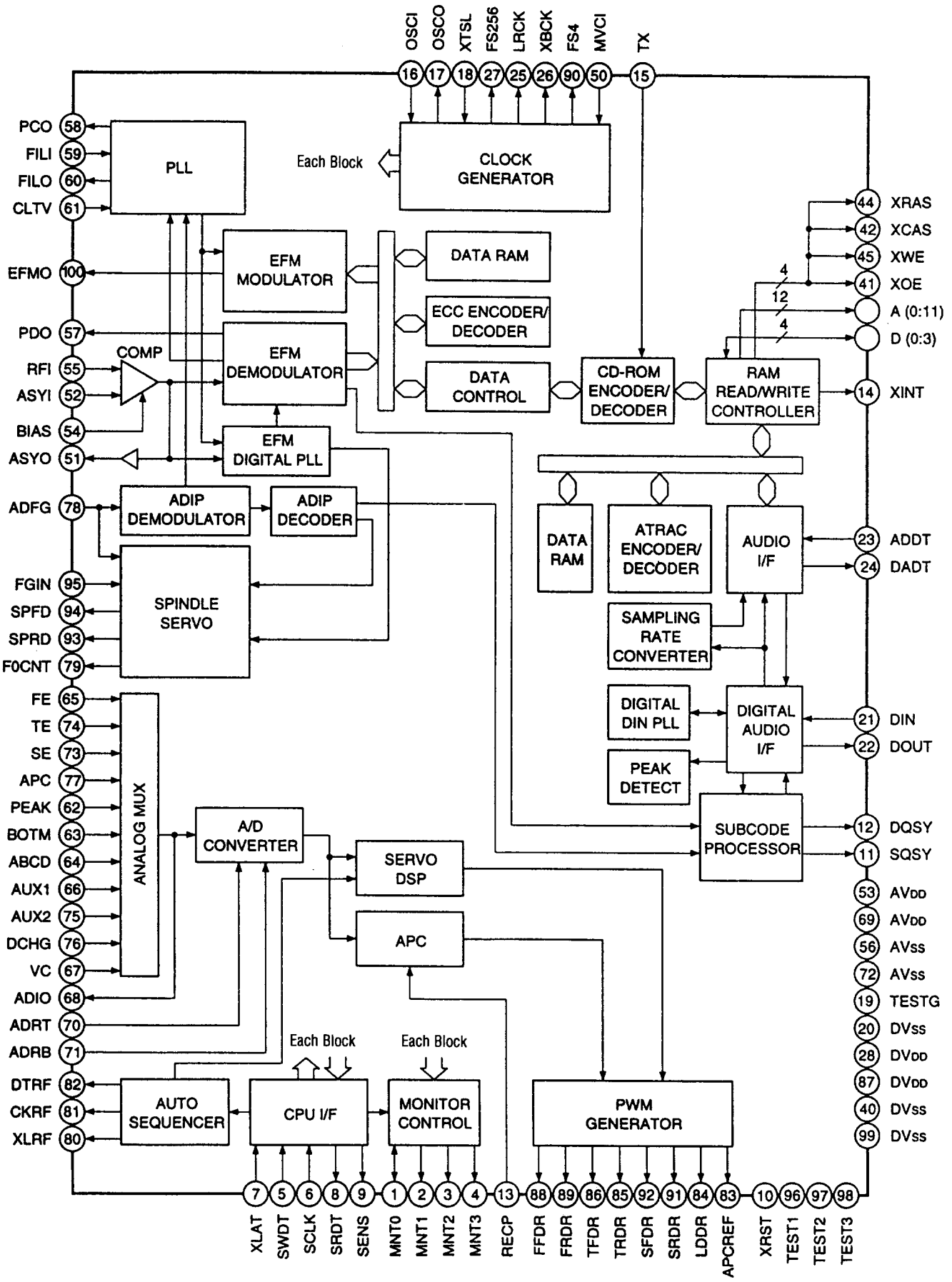
Maximum absolute rating (Ta=25°C)

• Power supply voltage	V_{DD}	Vss–0.5 to +4.6	V
• Input voltage	V_I	Vss–0.5 to V_{DD}+0.5	V
• Output voltage	V_O	Vss–0.5 to V_{DD}+0.5	V
• Power supply voltage difference			
	Vss–AVss	–0.1 to +0.1	V
	V_{DD}–AV$_{DD}$	–0.1 to +0.1	V
• Storage temperature	Tstg	–55 to +150	°C

Recommended operating conditions

• Power supply voltage	V_{DD}	2.75 to +3.6	V
• Operating temperature	Topr	–10 to +75	°C

Block Diagram



Pin Functions

Pin No.	Pin Symbol	I/O	Function
1	MNT0	I/O	Monitor input/output.
2	MNT1	O	Monitor output.
3	MNT2	O	Monitor output.
4	MNT3	O	Monitor output.
5	SWDT	I	Microprocessor serial bus data write input.
6	SCLK	I (S)	Microprocessor serial bus clock input.
7	XLAT	I (S)	Microprocessor serial bus latch input.
8	SRDT	O (3)	Microprocessor serial bus data read output.
9	SENS	O (3)	Outputs the internal status corresponding to the address of the microprocessor serial bus.
10	XRST	I (S)	Reset input. Reset at "L".
11	SQSY	O	ADIP sync output when PTGR (ADRS=$3B, DATA1 to D7)=0. DISC SUB-Q sync output when PTGR=1.
12	DQSY	O	Ubit SUB-Q sync output of the digital audio input from MD or CD.
13	RECP	I	Laser power switching input (H=Recording power/L=Playback power).
14	XINT	O	Interruption status output.
15	TX	I	Recording data output enable input.
16	OSCI	I	Crystal oscillation circuit input.
17	OSCO	O	Crystal oscillation circuit output.
18	XTSL	I	Crystal original oscillation frequency switching (L=45.1584 MHz/H=22.5792 MHz).
19	TESTG	—	Test input. Connect to the GND.
20	DVss	—	Digital GND.
21	DIN	I	Digital audio input.
22	DOUT	O	Digital audio output.
23	ADDT	I	Data input from A/D converter.
24	DADT	O	Data output to D/A converter.
25	LRCK	O	A/D, D/A converter LR clock output (44.1 kHz).
26	XBCK	O	A/D, D/A converter bit clock output (2.8224 MHz).
27	FS256	O	11.2896 MHz clock output (Crystal system).
28	DVDD	—	Digital power supply.
29	A03	O	External DRAM address output.
30	A02	O	External DRAM address output.
31	A01	O	External DRAM address output.
32	A00	O	External DRAM address output.
33	A10	O	External DRAM address output.
34	A04	O	External DRAM address output.
35	A05	O	External DRAM address output.
36	A06	O	External DRAM address output.
37	A07	O	External DRAM address output.
38	A08	O	External DRAM address output.
39	A11	O	External DRAM address output.
40	DVss	—	Digital GND.

Pin No.	Pin Symbol	I/O	Function
41	XOE	O	External DRAM output enable output.
42	XCAS	O	External DRAM $\overline{CAS}$ output.
43	A09	O	External DRAM address output.
44	XRAS	O	External DRAM $\overline{RAS}$ output.
45	XWE	O	External DRAM write enable output.
46	D1	I/O	External DRAM data input/output.
47	D0	I/O	External DRAM data input/output.
48	D2	I/O	External DRAM data input/output.
49	D3	I/O	External DRAM data input/output.
50	MVCI	I (S)	Clock input from external VCO.
51	ASYO	O	Playback EFM binarized signal output.
52	ASYI	I (A)	Playback EFM comparator slice level input.
53	AVDD	—	Analog power supply.
54	BIAS	I (A)	Playback EFM comparator bias current input.
55	RFI	I (A)	Playback EFM RF signal input.
56	AVss	—	Analog GND.
57	PDO	O (3)	Phase comparison output for playback EFM clock playback analog PLL.
58	PCO	O (3)	Phase comparison output for recording/playback EFM system master PLL.
59	FILI	I (A)	Filter input for recording/playback EFM system master PLL.
60	FILO	O (A)	Filter output for recording/playback EFM system master PLL.
61	CLTV	I (A)	Internal VCO control voltage input for recording/playback EFM system master PLL.
62	PEAK	I (A)	Light amount signal peak hold input (From CXA2523).
63	BOTM	I (A)	Light amount signal bottom hold input (From CXA2523).
64	ABCD	I (A)	Light amount signal input (From CXA2523).
65	FE	I (A)	Focus error signal input (From CXA2523).
66	AUX1	I (A)	Auxiliary A/D input. Connect to the power supply if not using.
67	VC	I (A)	Mid-point voltage input (From CXA2523).
68	ADIO	O (A)	A/D converter input signal monitor output.
69	AVDD	—	Analog power supply.
70	ADRT	I (A)	A/D converter operating range upper limit voltage input (0.9 VDD if opened).
71	ADRB	I (A)	A/D converter operating range lower limit voltage input (0.1 VDD if opened).
72	AVss	—	Analog GND.
73	SE	I (A)	Sled error input (From CXA2523).
74	TE	I (A)	Tracking error input (From CXA2523).
75	AUX2	I (A)	Auxiliary A/D input. Connect to the power supply if not using.
76	DCHG	I (A)	Connect to a low impedance power supply.
77	APC	I (A)	Laser digital APC (Auto Power Control) error-difference signal input (From CXA2523). Connect to the power supply if not using.
78	ADFG	I (S)	ADIP binarized FM signal input (22.05±1 kHz) (From CXA2523).
79	F0CNT	O	CXA2523 filter fo control output.
80	XLRF	O	CXA2523 control latch output.

Pin No.	Pin Symbol	I/O	Function
81	CKRF	O	CXA2523 control clock output.
82	DTRF	O	CXA2523 control data output.
83	APCREF	O	Reference PWM output for laser APC.
84	LDDR	O	PWM output for laser digital APC.
85	TRDR	O	Tracking servo drive PWM output (–).
86	TFDR	O	Tracking servo drive PWM output (+).
87	DVDD	—	Digital power supply.
88	FFDR	O	Focus servo drive PWM output (+).
89	FRDR	O	Focus servo drive PWM output (–).
90	FS4	O	176.4 kHz clock output (Crystal system).
91	SRDR	O	Sled servo drive PWM output (–).
92	SFDR	O	Sled servo drive PWM output (+).
93	SPRD	O	Spindle servo drive output (PWM–, or polarity).
94	SPFD	O	Spindle servo drive output (PWM+, or PWM absolute value)
95	FGIN	I (S)	Spindle CAV servo FG input.
96	TEST1	I	Test input. Connect to GND.
97	TEST2	I	Test input. Connect to GND.
98	TEST3	I	Test input. Connect to GND.
99	DVss	—	Digital GND.
100	EFMO	O	EFM output during recording.

*I (S) : Schmidt input
*O (3): 3-state output
*I (A) : Analog input
*0 (A): Analog output

Electrical Characteristics

D.C. characteristics

(V_{DD}=AV_{DD}=2.2 to 3.6V, Vss=AVss=0V, Topr=–10 to +75°C)

Item		Symbol	Conditions	Min.	Standard	Max.	Unit	Appropriate Pin
Input voltage (1)	Input voltage "H" level	V_{IH} (1)		0.7 V_{DD}			V	*1
	Input voltage "L" level	V_{IL} (1)				0.2 V_{DD}	V	
Input voltage (2)	Input voltage "H" level	Vt+	Schmidt input	0.7 V_{DD}			V	*2
	Input voltage "L" level	Vt–				0.2 V_{DD}	V	
	Hysteresis	Vt+–Vt–			0.5		V	
Input voltage (3)	Input voltage	V_{IN} (3)	Analog input	Vss		V_{DD}	V	*3, *7, *8
Output voltage (1)	Output voltage "H" level	V_{OH} (1)	I_{OH}=–2.4 mA	V_{DD}–0.4			V	*4, *5
	Output voltage "L" level	V_{OL} (1)	I_{OH}=2.4 mA			0.4	V	
Output voltage (2)	Output voltage "H" level	V_{OH} (2)	I_{OH}=–0.9 mA	V_{DD}–0.4			V	*6
	Output voltage "L" level	V_{OL} (2)	I_{OH}=0.9 mA			0.4	V	
Input leak current (1)		I_{LI} (1)	V_{IN}=Vss or V_{DD}	–40		40	V	*1, *3
Input leak current (2)		I_{LI} (2)	V_{IN}=0.15 to V_{DD}–0.15	–2.6		2.6	µA	*7
3-state output leak current		I_{OZ}	V_{IN}=Vss or V_{DD}	–40		40	µA	*5

Appropriate Pins

*1 SWDT, RECP, TX, XTSL, DIN, ADDT, D0, D1, D2, D3, MNT0
*2 SCLK, XLAT, XRST, MVCI, ADFG, FGIN
*3 ASYI, FILI, CLTV
*4 MNT0, MNT1, MNT2, MNT3, SQSY, DQSY, XINT, DOUT, DADT, LRCK, XBCK, FS256, A00, A01, A02, A03, A04, A05, A06, A07, A08, A09, A10, A11, XOE, XCAS, XRAS, XWE, D0, D1, D2, D3, ASYO, F0CNT, XLRF, CKRF, DTRF, APCREF, LDDR, TRDR, TFDR, FFDR, FRDR, FS4, SRDR, SFDR, SPRD, SPFD, EFMO
*5 SRDT, SENS, PDO, PCO
*6 FILO
*7 PEAK, BOTM, ABCD, FE, AUXI, VC, SE, TE, AUX2, DCHG
*8 BIAS, RFI

A.C. characteristics

(1) OSCI Pin

1) Automatic oscillation

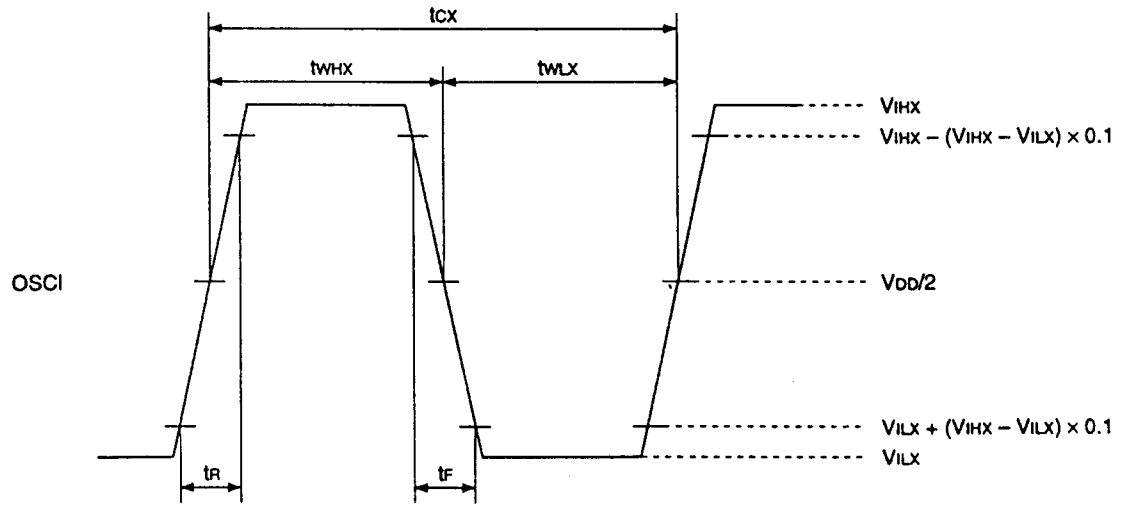
(V_{DD}=2.2 to 3.6V, Topr=–10 to +75°C)

Item	Symbol	Conditions	Min.	Standard	Max.	Unit
Oscillating frequency	fMAX	XTSL=0	44.8	45.1584	45.6	MHz
		XTSL=1	22.4	22.5792	22.8	

2) When inputting pulses to OSCI Pin

(V_{DD}=2.2 to 3.6V, Vss=0V, Topr=–10 to +75°C)

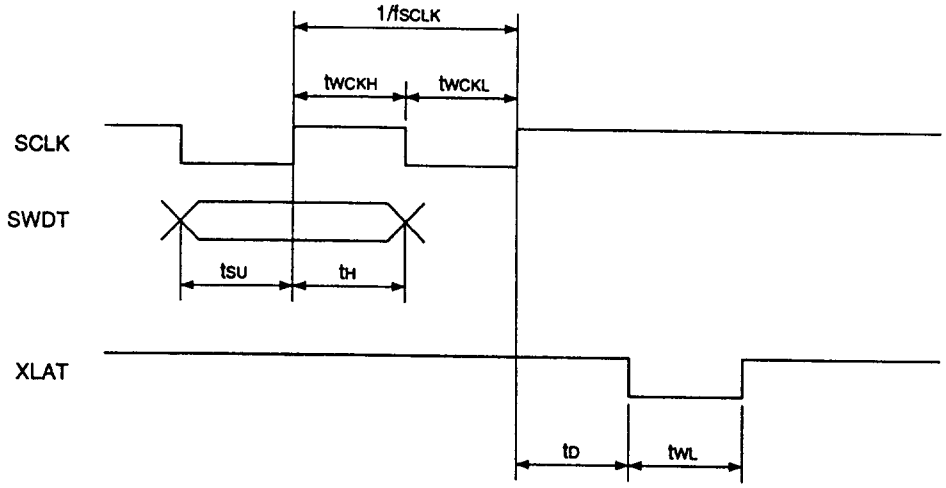
Item	Symbol	Conditions	Min.	Standard	Max.	Unit
"H" level pulse width	t_{WHX}	XTSL=0	7			ns
		XTSL=1	16			
"L" level pulse width	t_{WLX}	XTSL=0	7			ns
		XTSL=1	16			
Pulse cycle	t_{CK}	XTSL=0	21.9		22.3	ns
		XTSL=1	43.9		44.6	
Input "H" level	V_{IHX}	—	0.7 V_{DD}			V
Input "L" level	V_{ILX}	—			0.2 V_{DD}	V
Rising time Falling time	t_R, t_F	—			7	ns



(2) SCLK Pin , SWDT Pin , XLAT Pin

(VDD=2.2 to 3.6V, Vss=0V, Topr=–10 to +75°C)

Item	Symbol	Min.	Standard	Max.	Unit
Clock frequency	fSCLK			5	MHz
Clock pulse width	tWCKH, tWCKL	100			ns
Setup time	tSU	30			ns
Hold time	tH	30			ns
Delay time	tD	100			ns
Latch pulse width	tWL	700			ns



10-3. AK4515-VQ

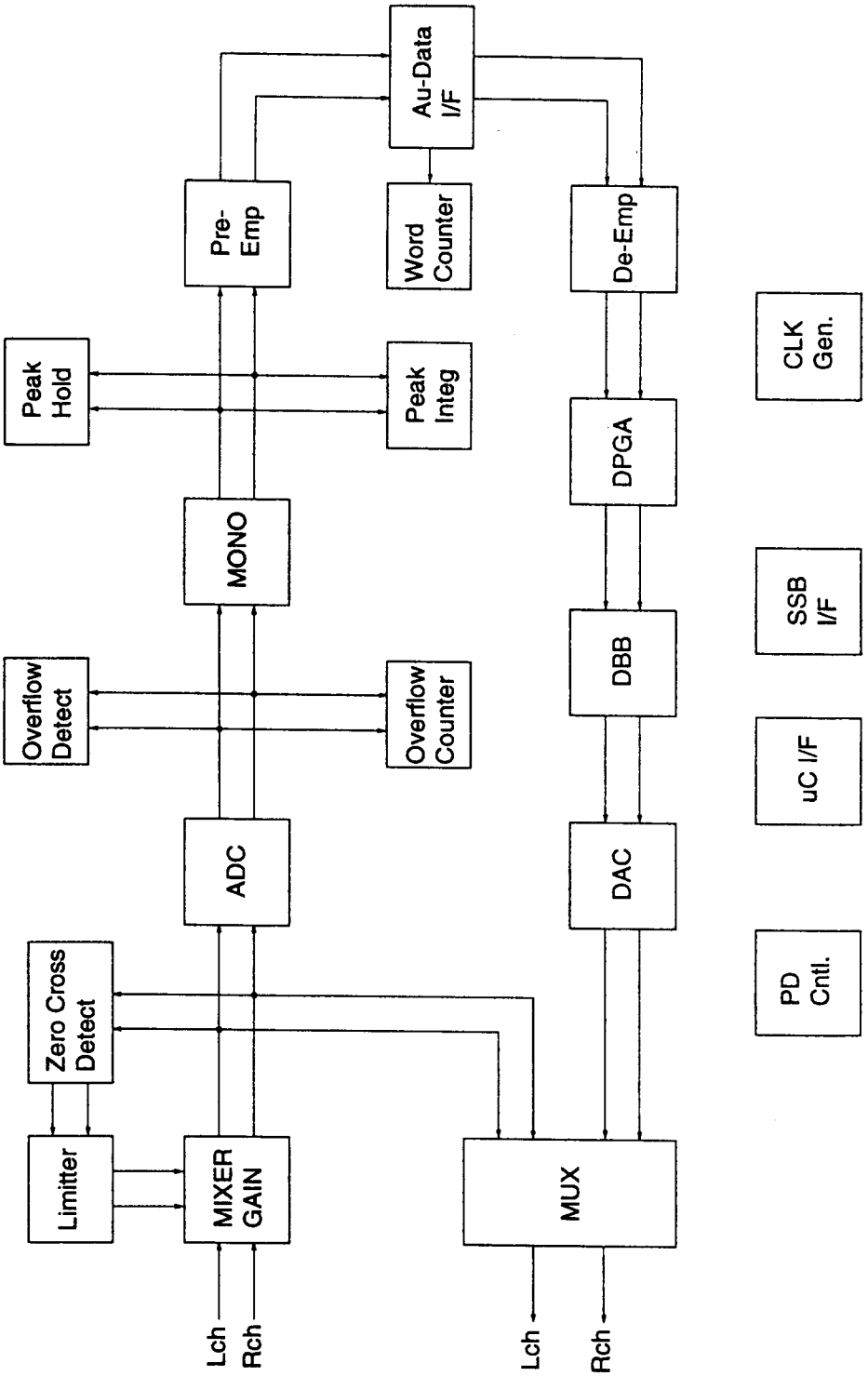
AK4515-VQ

AD/DA CONVERTER

Features

1. Resolution: 16 bits
2. Recording functions
   - 3-stereo input mixer
   - ANalog input PGA
   - Overflow flag
   - Peak meter output
   - Offset calibration function
   - Digital Pre-emphasis filter (Corresponding to tc=50/15 μs, 3-frequency)
3. Playback functions
   - Digital De-emphasis filter (Corresponding to tc=50/15 μs, 3-frequency)
   - Digital output PGA
   - DBB
4. Analog through mode
5. Power management function
6. ADC input
   - Single end input
   - Input level: 1.62 Vpp (=0.6 x VA, VA=2.7V)
   - F characteristics: ±0.5 dB (to 20 kHz)
   - THD+N: –8.3 dB
   - DR, S/N: 90 dB
7. DAC output
   - Single end output
   - Output level: 1.62 Vpp (=0.6 x VA, VA=2.7V, R_L=10 kΩ)
   - F characteristics: ±0.5 dB (to 20 kHz)
   - THD+N: –83 dB
   - DR, S/N: 90 dB
8. Master clock: 256 fs/384 fs
9. Audio data format
   - ADC side 16 bits
   - DAC side 16 bits
10. Power supply voltage: 2.55 to 3.6V (2.7 Vtyp)
11. Current consumption: 21 mA
12. 48 Pin LQFP (0.5 mm pitch)

Block Diagram



Pin Functions

Pin No.	Pin Symbol	I/O	Function
1	MCLK	I	Master Clock Input Pin
2	LRCK	I	Input/Output Channel Clock Pin
3	BCLK	I	Audio Serial Data Clock Pin
4	SDTO	O	Audio Serial Data Output Pin
5	SDTI	I	Audio Serial Data Input Pin
6	DIF0	I	Audio Data Interface Format Pin
7	DIF1	I	Audio Data Interface Format Pin
8	TST3	O	Test Pin
9	TST4	O	Test Pin
10	DCODE0	I	Device Code 0 Pin
11	DCODE1	I	Device Code 1 Pin
12	DCODE2	I	Device Code 2 Pin
13	$\overline{CS}$	I	Chip Select Pin "H" in the SSB mode
14	CCLK	I	Control Clock Input Pin SCK in the SSB mode
15	CDTO	O	Control Data Input Pin SSO in the SSB mode
16	CDTI	I	Control Data Input Pin SSI in the SSB mode
17	DGND	—	Digital Ground Pin
18	VD	—	Digital Power Supply Pin. +2.7V
19	VB	—	Substrate Pin. +2.7V
20	VA	—	Analog Power Supply Pin. +2.7V
21	AGND	—	Analog Ground Pin
22	VCOM	O	Common Voltage Output Pin. VA/2
23	NC		No Connection
24	DZF	O	Zero Detect Pin
25	ROUT	O	Rch analog Output Pin
26	LOUT	O	Lch analog Output Pin
27	VRDA	I	DAC Voltage Reference Input Pin. VA
28	NC		No Connection
29	NC		No Connection
30	VRAD	I	ADC Voltage Reference Input Pin. VA
31	PGAR	O	Rch PGA Output Pin
32	ADCR	I	Rch ADC Input Pin
33	VCMR	O	Rch ADC Common Voltage Output Pin. VA/2
34	VCML	O	Lch ADC Common Voltage Output Pin. VA/2
35	ADCL	I	Lch ADC Input Pin
36	PGAL	O	Lch PGA Output Pin
37	RIN3	I	Rch #3 Input Pin
38	LIN3	I	Lch #3 Input Pin
39	TST2	I	Test Pin (Pull down pin)
40	RIN2	I	Rch #2 Input Pin
41	LIN2	I	Lch #2 Input Pin
42	TST1	I	Test Pin (Pull down pin)
43	RIN1	I	Rch #1 Input Pin
44	LIN1	I	Lch #1 Input Pin
45	SSB	I	Control I/F Mode Select Pin "H": SSB, "L": AKM
46	XRST	I	Reset Pin
47	$\overline{PD}$	I	Power Down Pin
48	CMODE	I	Master Clock Select Pin "H": 384 fs, "L": 256 fs

Description of Functions

■ System clock

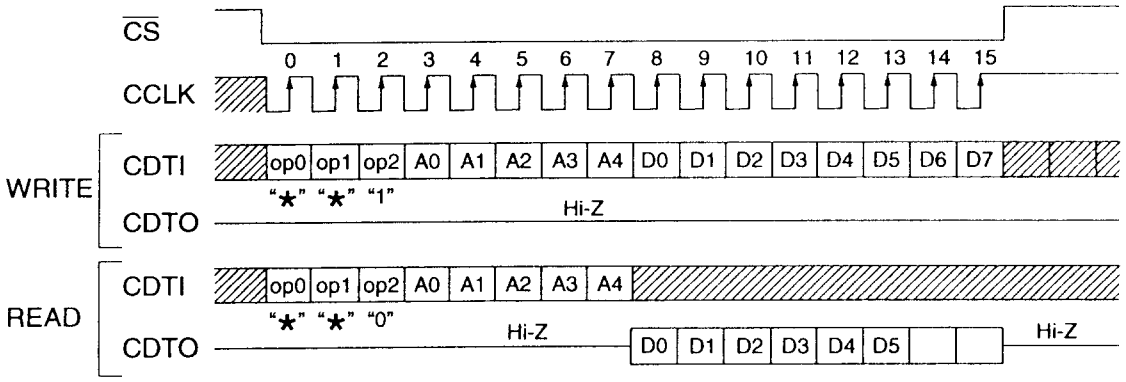
The clocks required are MCLK (256 fs/384 fs), LRCK (fs), and BCLK (32 fs). Although the master clock (MCLK) and sampling clock (LRCK) need to be synchronized, the phase need not be matched. The frequency of MCLK is determined according to LRCK and CMODE. When CMODE is "L", MCLK is 256 fs, when "H", it is 384 fs. When 384 fs is selected, MCLK is frequency-divided by 2/3 inside.
* fs is the sampling rate.

AK4515 incorporates a phase detection circuit for LRCK input from outside. Thus if internal timings deviate due to frequency changes of the clocks, etc., during operations, they are reset automatically to adjust the phase. For this reason, reset from outside is not required except when turning ON the power. (Refer to the section on asynchronized reset.)

While ADC and DAC are operating, the external clocks (MCLK, BCLK, and LRCK) cannot be stopped. If these clocks are not supplied, an overcurrent flows, and operations may become abnormal because a dynamic logic is used inside. To stop the clock, set the power down state.

■ R/W timing of control register

- AKM mode
  In the AKM mode, a 4-wire serial I/F is used , and the I/F data is composed of ope-codes (3 bits), address (LSB first, 5 bits), and control data (LSB first, 8 bits). Bits are output by the "↓" of the CCLK at the data transmission side, and input by the "↑" at the receiving side. Data writing is enabled at the "↑" of $\overline{CS}$ while for data reading, the output is Hi-Z at the "↑" of $\overline{CS}$. Set $\overline{CS}$ to "H" when not accessing. CDTI and CDTO can be connected to perform I/F using the the 3-wire.
  Reading and writing of addresses other than 00H to 13H are prohibited. While $\overline{CS}$ is "L", always perform CCLK "↑" sixteen times.

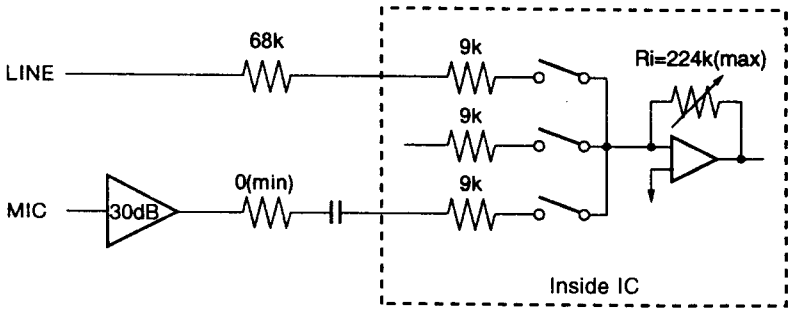


op0-op2: Op-code(**1: WRITE, **0: READ)
A0-A4: Address
D0-D7: Control Data

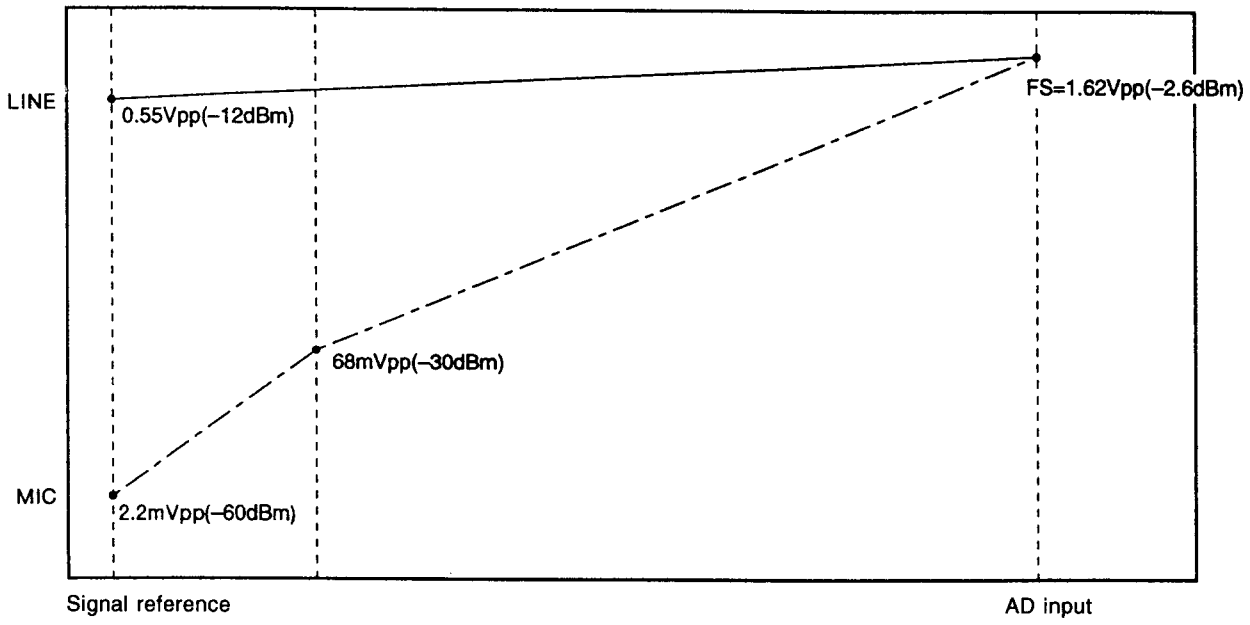
Control Data Timing (AKM)

■ Analog PGA with Zero Detection Function

Zero detection is performed for the L and R individually. When no zero cross, it is switched forcibly by time-out. The time-out time is proportionate to fs. It is 46.4 ms when To=2048/fs. fs=44.1 kHz. The zero cross detection function can be turned ON/OFF at the ZEIP bit. When turned OFF, writing the IPGA will promptly change the gain.
When a resistance is input externally in serial, the gain must be compensated as a whole system because the absolute accuracy of the internal resistance becomes 30%.

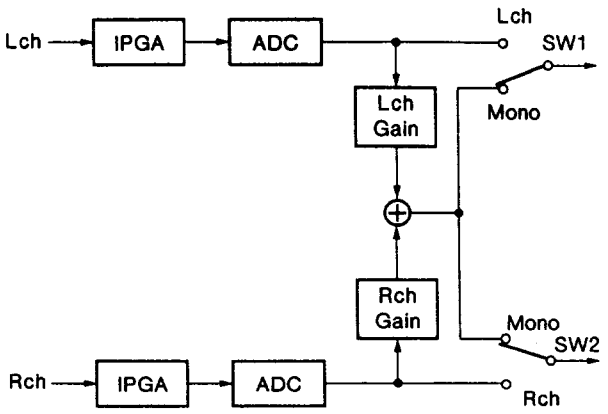


Line Gain(max)=20log10(224/77)=9.3dB
MIC Gain(max)=20log10(224/9)=28dB



Input PGA Gain Setting Example

■ Monaural Mixing



Block Diagram of Monaural Mixing Section

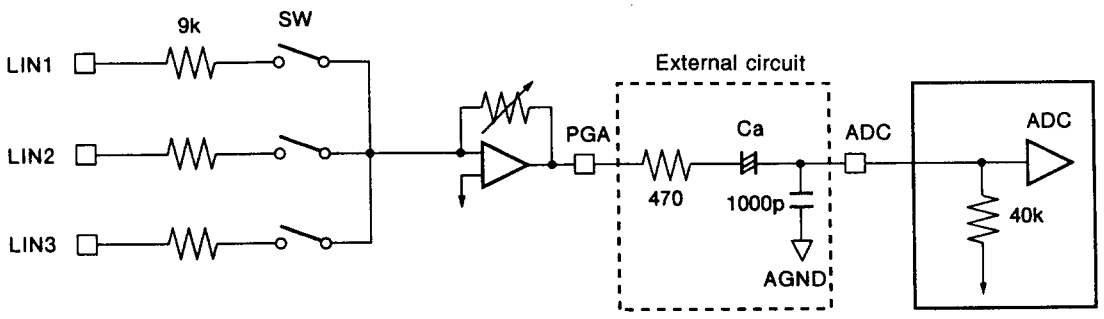
Mode	SW1	SW2	Lch GAIN	Rch GAIN	MONO1	MONO0
Stereo recording	Lch	Rch	—	—	0	0
Monaural recording Stereo recording	MONO	MONO	0.5	0.5	0	1
Monaural recording Lch input only	MONO	MONO	1.0	0	1	0
Monaural recording Rch input only	MONO	MONO	0	1.0	1	1

Monaural Mode Setting

■ Offset Calibration Function

Cancels the ADV offset. Start when the XRST Pin is set from "L" to "H".
Offset calibration is performed including the PGA in the previous stage.
During calibration, the PGA whose SW has been turned OFF sets into the MUTE state, and the PGA and ADC offset is written in the ADC offset memory. After this, the offset is deducted from the ADC conversion data, and the value is output from SDTO. After completing offset calibration, the PGA gain is set to 0 dB. Normally, PGA and ADC are used for DC cutting to cancel the PGA offset. The Ca capacity is determined taking into consideration the settling of Ca during the calibration time (8224/fs=186 ms, @fs=44.1 kHz). As the termination resistance of ADC is 40 kΩ (typ), it is recommended that Ca be set to below 0.47 μF. At this time the HPF fs becomes 8.5 Hz.

To decrease fc even further, to set Ca to 1 μF, it is necessary to set the reset time (time during which XRST is "L") to minimum 200 ms.



Previous Stage Circuit of ADC (Dotted lines indicate the external circuit)

■ De-emphasis

Incorporates a digital de-emphasis circuit with 50/15 μs characteristics.

■ Output digital PGA with zero detection function

Zero detection is performed for the L and R individually. When no zero cross, it is switched forcibly by time-out.
The time-out time is proportionate to fs. It is 46.4 ms when To=2048/fs. fs=44.1 kHz. The zero cross detection function can be turned ON/OFF at the ZEOP bit. When turned OFF, writing the OPGA will promptly change the gain.

■ DBB

Mode	DBB1	DBB0
OFF	0	0
MIN	0	1
MID	1	0
MAX	1	1

MZ-R30

SONY

SERVICE MANUAL

US Model
Canadian Model
AEP Model
UK Model
E Model
Australian Model
Tourist Model

CORRECTION - 1

Correct your Service Manual as shown below.

☛ : Indicates corrected portion

ELECTRICAL ADJUSTMENT

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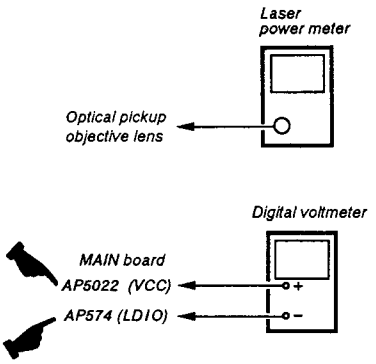
5-4. Laser Power Check

Connection :



Adjusting Method :

1. Set the servo mode of the test mode (Mode : 000).
2. Press the ▶ key, and set the laser power adjustment mode (Mode : 020) using the volume + and − keys.
3. Press the ⏮ key and move the optical pickup to the inner most circumference
4. Open the cover and set the laser power meter on the objective lens of the optical pickup.
5. Press the ▶ key, and set the laser MO read adjustment mode (Mode : 021).
6. Check that the laser power meter reading is 0.85 ± 0.085mW.
7. Check that the voltage between AP5022 (VCC) and AP574 (LDIO) at this time is below 44mV. ☛
8. Press the ▶ key, and set the laser MO write adjustment mode (Mode : 022).
9. Check that the laser power meter reading is 6.8 ± 0.68mW.
10. Press the ⏸ key to finalize the adjustment data.
11. Check that the voltage between AP5022 (VCC) and AP574 (LDIO) at this time is below 88mV. ☛
12. Press the ■ key.
13. Exit the test mode.

☛ : Indicates corrected portion

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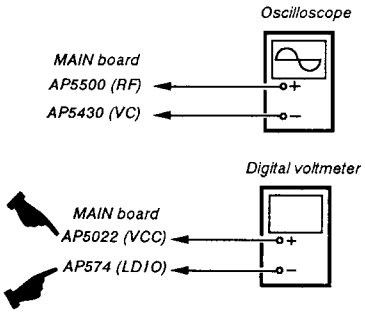
5-8. CD RF Level Check

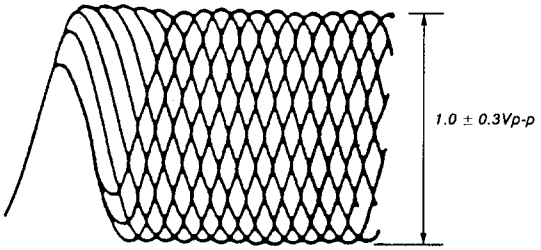
Connection :



Adjusting Method :

1. Set the servo mode of the test mode (Mode : 000).
2. Press the ▶ key, and set the CD playback adjustment mode (Mode : 050) using the volume + and − keys.
3. Press the ⏮ and ⏭ keys and move the optical pickup to the center circumference.
4. Load a CD test disc (TDYS-1).
5. When the ▶ key is pressed, the CD EF balance adjustment mode (Mode : 052) will be set after CD focus search ON (Mode : 051).
6. When the ▶ key is pressed, the ABCD level adjustment mode (Mode : 053) is set.
7. Press the ⏸ key to perform automatic adjustment, and check that the RF level is 1.0 ± 0.3Vp-p.

(RF waveform)



8. Check that the voltage between AP5022 (VCC) and AP574 (LDIO) at this time is below 44mV. ☛
9. Press the ■ key.
10. Exit the test mode.

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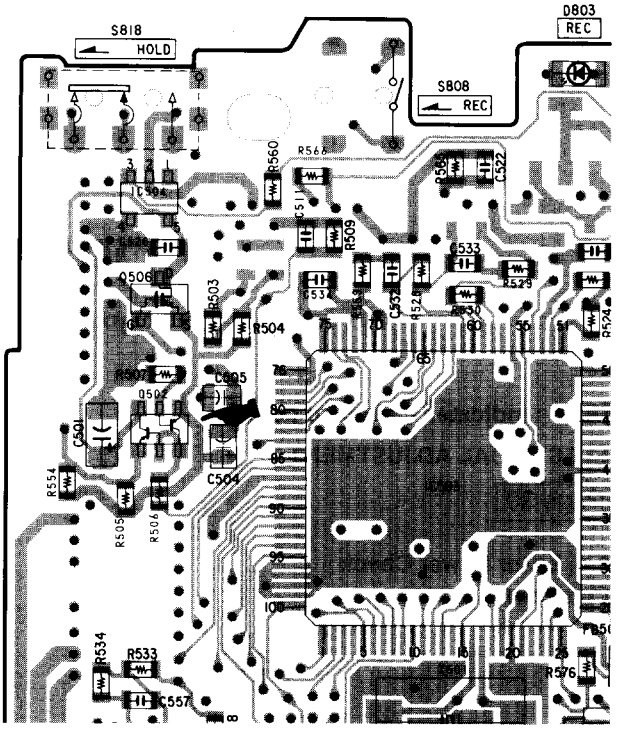
7-3. PRINTED WIRING BOARDS – MAIN SECTION –

【MAIN BOARD 】 (SIDE B)